Thomas Anderson

THE HISTORY OF THE PANZERJÄGER

VOLUME 1: ORIGINS AND EVOLUTION 1939–42

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PANZERJÄGER

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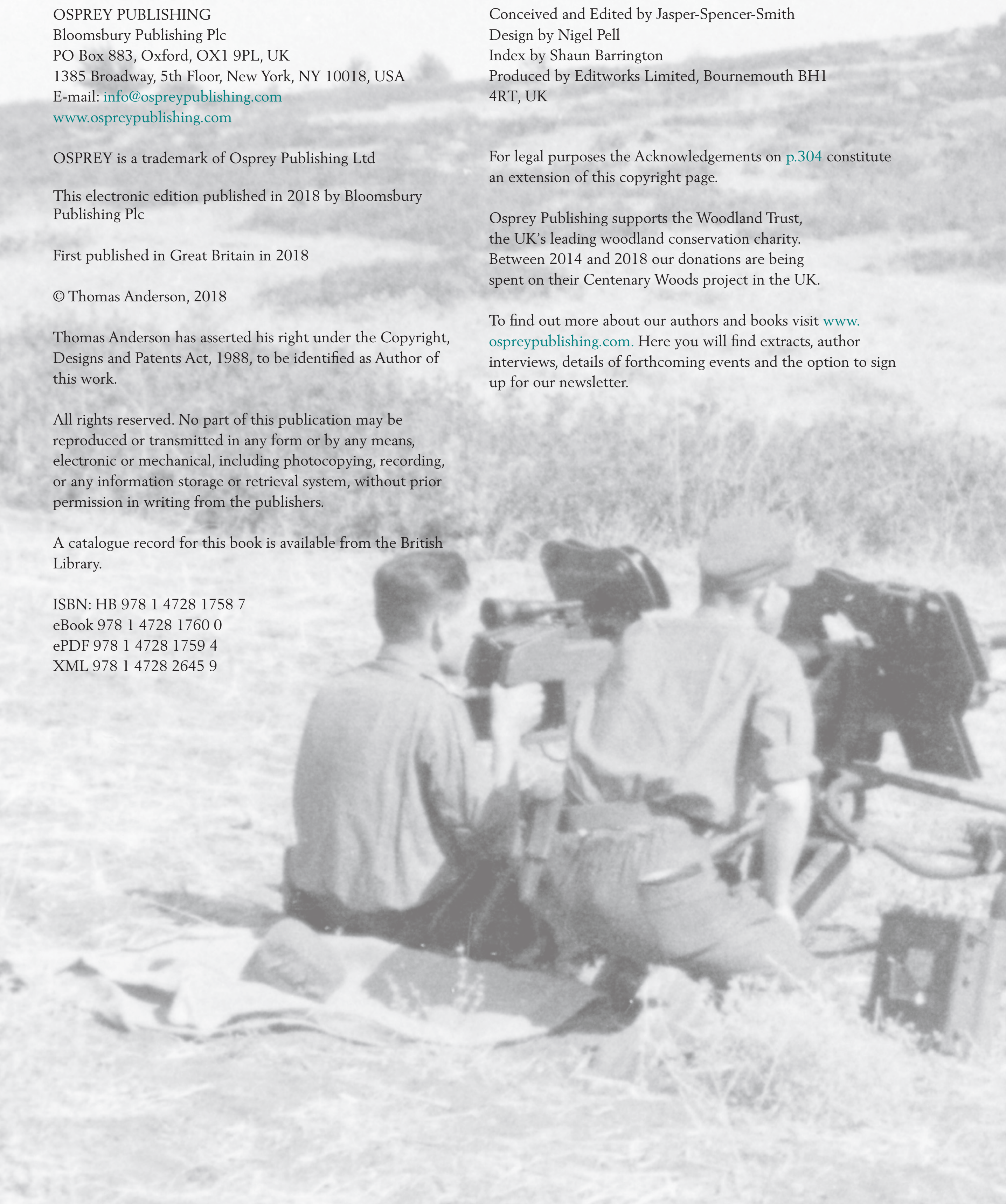
NZERJÄGER

Thomas Anderson



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Introduction

The *Panzerjäger* was a branch of the German army dedicated to the task of tank hunter (*jäger*); to seek and destroy enemy tank forces. In World War II, the *Panzerjäger* were an important subunit of almost every division – *infanterie* (infantry), *gebirgs* (mountain) and *panzer* (tank) – and also to battalions at army level.

An abbreviation of *jäger* would appear again in the designation *Jagdpanzer*, a heavily armed and armoured tank hunter developed from the *Sturmgeschütz*.

The term *Panzerjäger* originated in World War I, when German soldiers in their trenches came under attack from a previously unknown and unexpected menace: the tank.

The concept of the continuous-track propulsion system can be traced back to the 1770s and developments continued over the following 130 years. In 1901, Alvin Lombard, an American inventor, used his version of the system for his patented ‘Steam Log Hauler’.

In 1905, an improved type of continuous track was designed and patented by the British manufacturer Hornsby of Grantham. A number of artillery tractors, powered by a combustion (paraffin) engine, were built for and trialled by the British Army.

Development of a tracked armoured vehicle was begun by Col Swinton and Col Hankey and in 1915 their work resulted in a machine known as ‘Little Willie’, the first combat tank.

Improvements to artillery weapons, including the introduction of barrel recoil, had significantly increased the rate of fire and accuracy. Rifles fitted with a multi-round magazine and improved machine guns resulted in a considerable improvement to the firepower of the infantry.

French civilians pose with a German Tank-Gewehr captured by British soldiers. The 13mm heavy calibre anti-tank rifle was the first dedicated anti-tank weapon for use by the infantry. The bullet it fired could easily penetrate the relatively thin armour on those first tanks.

The *Maschinengewehr* (MG – machine gun) 08, the standard German machine gun, proved to be able to penetrate the unhardened steel of enemy tanks by concentrated fire at one point. The MG 08 was mounted on a low tripod and manned by a crew of three.

However, despite the many technical innovations and improvements to weapons, the war continued to be fought by the infantry, which led to an inevitable stalemate: a new tactical approach was required to breach battlefronts. The British and French were the first to combine the three main factors in warfare – firepower, mobility, protection – and introduced a new weapon to the battle: The tank.

An armoured vehicle fitted with tracks, impervious to fire from infantry weapons, proved to be capable of breaking through enemy lines and continuing the attack. After breaching the trench defences, machine-gun nests and field artillery positions could be directly attacked, which allowed following infantry forces to exploit the situation and attack the enemy from the rear.

British military planners were adamant that existence of the type should be kept totally secret, until sufficient numbers were available for a large-scale commitment. More time was required for training and also to rectify numerous technical and mechanical problems to avoid unnecessary losses on the battlefront.

However, overwhelming political pressure forced the army to sanction a small-scale attack, using the first 50 tanks produced, in the Battle of Flers-Courcelette (15 to 22 September 1916).

Although the small number of tanks could not achieve a decisive breakthrough, the British-built Mk I tank deployed for the battle demonstrated its remarkable capabilities. However, the surprise effect was gambled away.

This new weapon not only came as a shock to German troops in the trenches, but also to the *Oberste Heeresleitung* (OHL – supreme command of the army). On 11 September 1916, the OHL sent a report on the British tank, illustrated with sketches, to the military leadership with the following remark:

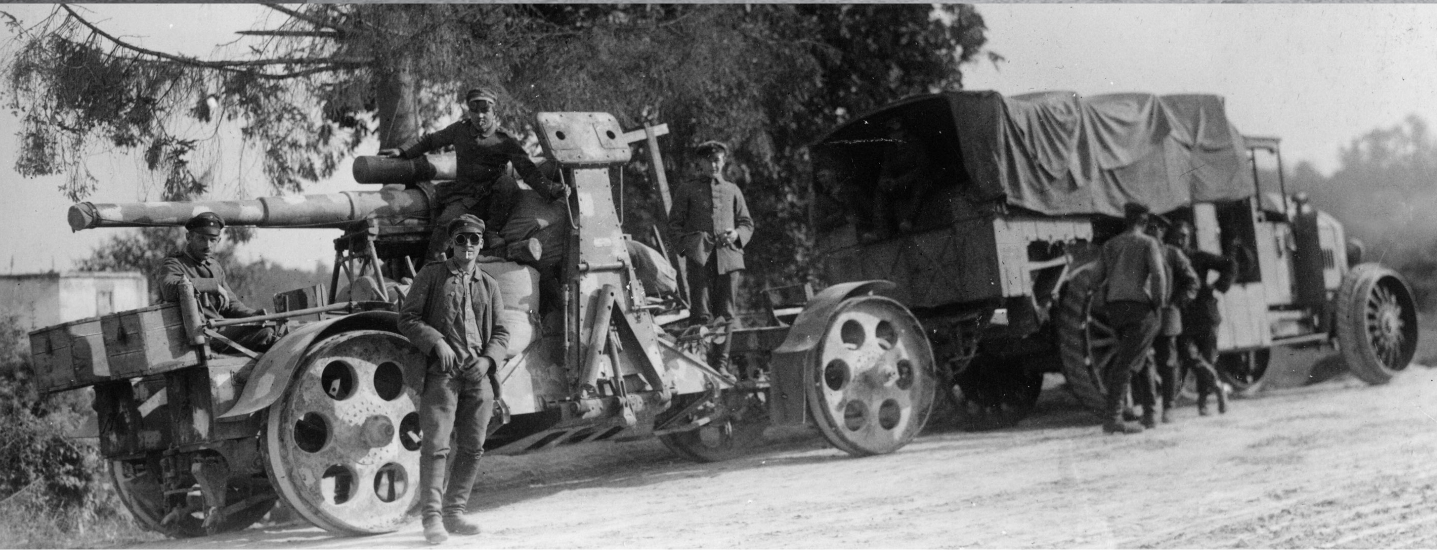
> Without overestimating, it cannot be denied that the actions of these *Kampfwagen* [combat car] resulted in a number of successes. In any case, an improved *Kampfwagen* would certainly be an effective weapon.

Just seven days later, a further letter stated (note the absence of appropriate German designations for the new weapon):

> British armoured vehicles again brought their troops many advantages. The morale impact of the vehicle is immense, since the soldiers in the trenches are helpless. Luckily, this terror was contained and did not spread along our front. At three points, where Autos [tanks] had broken through, all were shot to pieces by artillery. The artillery was used to halt the advance by the 'tanks' with some success. At short range *Minenwerfer* [trench mortar] and trench guns were used in proximity to the frontline. These were supported, with varying degrees of success, by machine guns and rifles firing armour-piercing bullets.

In 1917, the British significantly increased tank production, while the French began to introduce armoured vehicles into service. For German forces, the search for an effective defence against the tank became essential.

Soon after the surprise and fear brought about by the first massed tank attacks by the British was overcome, German forces utilized almost every available light and medium field gun for defence against the new threat. The 10.5cm leFh 16 was sufficiently powerful, but only at very close range, to destroy an armoured vehicle.



The 8.8cm Kraftwagen-Zug-FlaK L/45 (Krupp), here with a Krupp-Daimler KD towing vehicle, was the most effective gun available to German forces and could destroy enemy armour at long ranges. The weapon was the forerunner of the famous FlaK gun.

The above note from the OHL shows that the soldier in the trenches relied, above all, on the artillery. Even allowing for the limited destructive power of available ordnance, combat against tanks was easily possible, but German artillery was severely hindered by the lack of mobility.

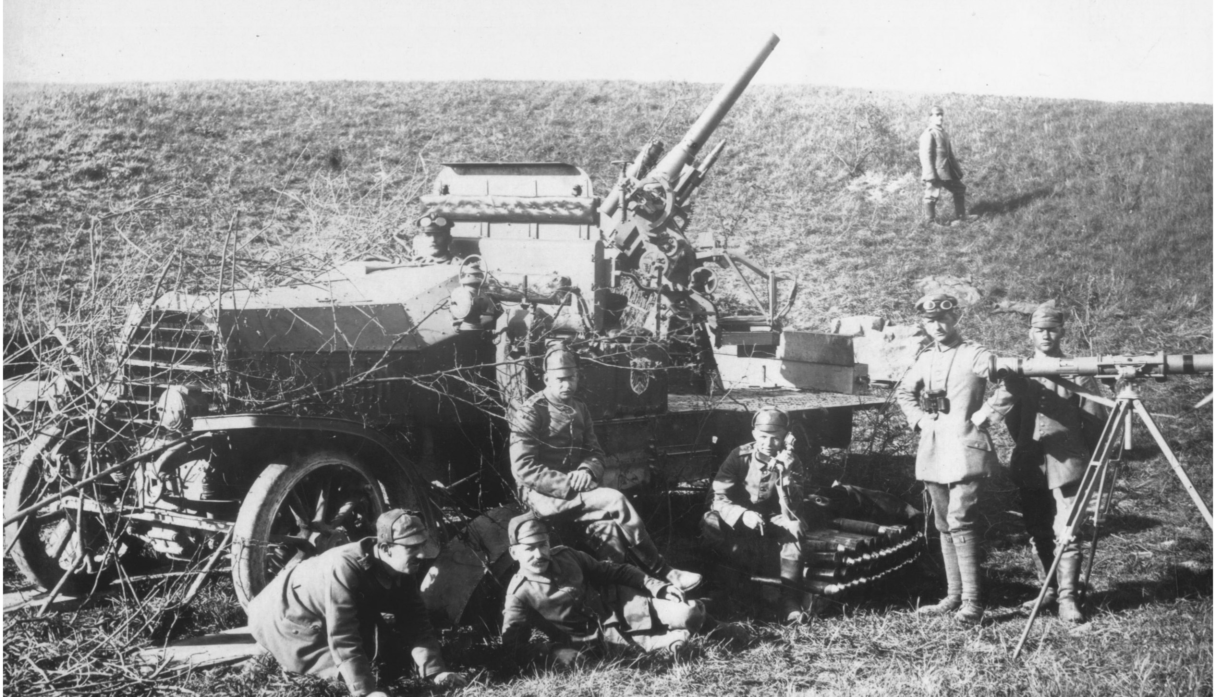
As the year progressed, German military planners were urged to consolidate the anti-tank defences. Besides improvements to the standard artillery gun, new specialized equipment had to be developed. Totally unaware of the situation concerning anti-tank weapons, the OHL considered it to be of low priority and did not proceed with the matter.

In July 1918, the 51.Armeekorps issued the following instructions for anti-tank defence:

> St.Quentin, 23 July 1918
>
> Organization of anti-tank defence:
> For the organization of the above, the following should be taken into consideration; that ditches, streams, stretches of marshy ground, and wooded areas constitute obstacles for tanks. The distribution of defensive forces should be regulated in accordance with the consideration that co-operation between the infantry and artillery must be assured.
>
> I. Artillery
> The anti-tank defence must be prepared in such a manner that the greatest possible number of guns will be used. A distinction must be made between:
> (a). The anti-tank guns, positioned in depth between the frontline and the artillery zone, should only be used for defence against tanks. An ammunition supply of 250 to 500 rounds will be sufficient for these guns.

(b). Artillery sections assigned to anti-tank defence. Each division designates an anti-tank section from the (frontline or reserve) field artillery. The anti-tank section will be provided with horses and held in readiness for an 'urgent' alert. The gun limbers will carry steel-pointed shells, and two wagons will carry extra shells including shrapnel. Numerous firing positions covering the battlefront (even the front-line infantry area), should be reconnoitred. It is unnecessary to establish an ammunition dump at each position, as ammunition-carrying wagons will deliver extra supplies.
(c). Artillery [field guns, light howitzers and heavy field howitzers] in position will go into action, using direct fire, against any tanks which achieve a breakthrough. A sufficient supply of ammunition will be kept in readiness.
(d). Heavy batteries, whose opportunities for observation are especially favourable for combat against any tanks which have penetrated our lines. For these batteries, the terrain will be divided into zones for the purpose of anti-tank combat. The range to certain important points will be determined in advance and communicated to the artillery.

II. Heavy machine gun
As a rule, all heavy machine guns, even those held in reserve, will be supplied with armour-piercing ammunition. The gunners must be made fully aware that it is their primary mission to combat any tank which has penetrated into their zone of defence. Any machine-gun teams positioned at points thought to be easily penetrated by tanks are to be made aware that they have a special responsibility. For this reason they will be designated as 'anti-tank machine gunners.'



The 7.7cm Kraftwagen-FlaK L/27 was one of the first *Ballon-Abwehr-Kanone* (BAK – anti-balloon guns) introduced by the German army. Although it was very manoeuvrable on firm, made-up roads, any commitment against tanks on an open battlefield was difficult.

> III. T-Gewehr
> The T-Gewehr will generally be placed in front-line positions or a short distance from the rear, due to the limited 500m range of this weapon.
>
> IV. Trench mortar
> Light trench mortars are to be positioned in depth in a staggered defensive line along the front. Each position will have at least two mortars, and will be distributed throughout the frontline with the same orders as those issued to the anti-tank machine gunners.
>
> V. Anti-tank mine
> The final line of anti-tank defence: Firstly, the mines are best placed in the outer defensive zone and then in sufficient numbers covering strong points in the intermediate zone and support positions. Troops will be trained in their use and will be taught how to lay a concentrated pattern of mines for anti-tank combat.
> When a tank attack is launched, all suitable armament must be used for anti-tank combat and continue firing until the last enemy tank has been destroyed.
> If the tanks are destroyed by our artillery fire, the entire attack fails.
> All troops must be made aware of this fact.
>
> *Generalleutnant* Eberhard von Hofacker

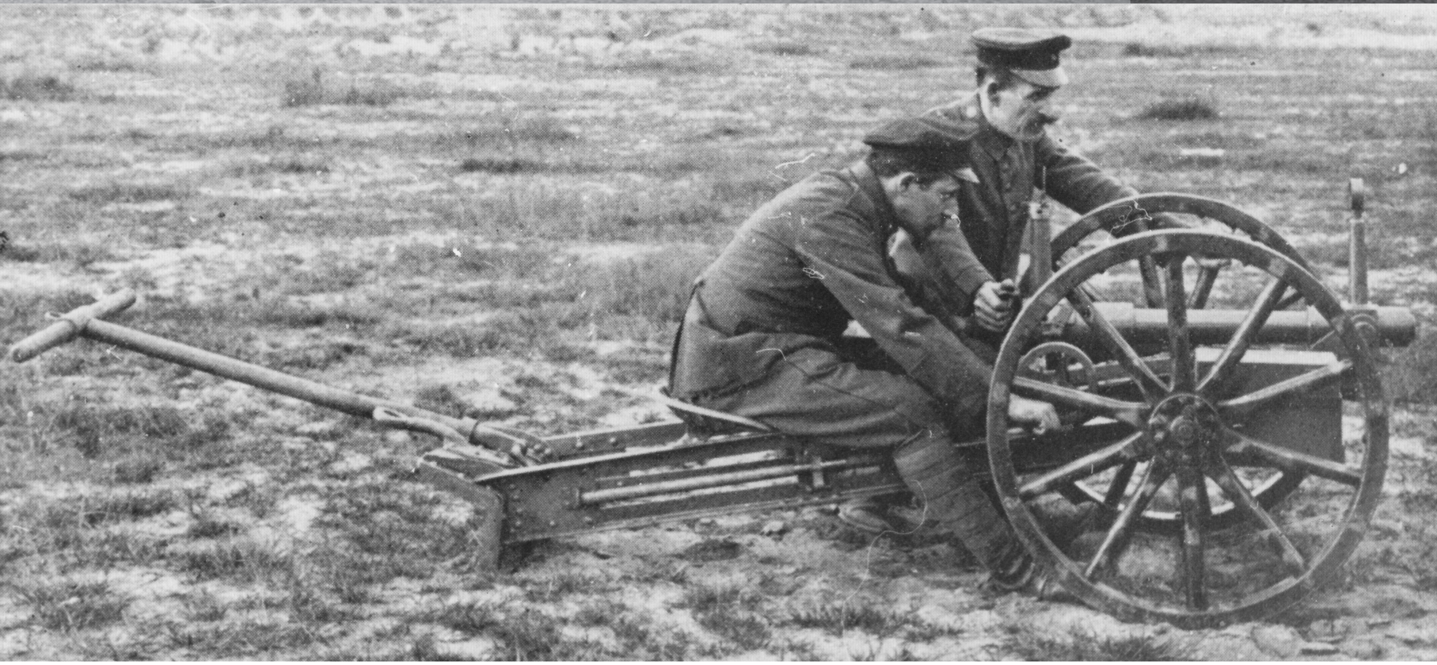
However, the performance of the available weapons was wilfully overestimated.

Infantry Weapons

The standard-issue infantry rifle, the *Karabiner* (carbine) 98k and the water-cooled *Maschinengewehr* (MG – machine gun) 08/15 were supplied specialized ammunition; the *Spitzgeschoss mit Kern* (SmK – steel-cored armour-piercing bullet). At a range of 100m, the bullet was designed to penetrate steel up to 8mm thick. On some occasions, concentrated fire at one place would weaken and penetrate the plating of an enemy tank. However, in practice neither the 98k nor the MG 08/15 proved capable of defeating the British or French tanks..

The T-Gewehr

The *Tank-Gewehr*, or T-Gewehr was developed by Mauser Aktiengesellschaft following an order from the *Gewehrprüfungskommision* (rifle assessment commission) dated December 1917. Mauser AG began work immediately and, by using the standard 98k infantry rifle as a pattern, produced a scaled-up version



At the end of World War I, a new type of anti-tank gun with a 3.7cm calibre began to enter service. The weapon had sufficient firepower to defeat any known armour while being light enough to be moved by the crew. Armaments manufacturer Rheinmetall produced the first 3.7cm *Tankabwehrkanone* (TaK) by utilizing parts from existing guns. It was fitted with a simple ring-type gunsight and the ammunition was stowed in two boxes mounted on the front of the carriage. Rheinmetall had delivered some 6,000 of the 3.7cm TaK by the end of World War II.

and delivered the first prototype in January 1918. The new anti-tank rifle had a heavy calibre of 13mm and a combat weight of 17kg. First trials of the gun proved it to be a promising weapon, and a first order of 30,000 rifles was placed without further troop trials. The gun fired a solid armour-piercing bullet which could penetrate the armour of all tanks in current use by the British and French.

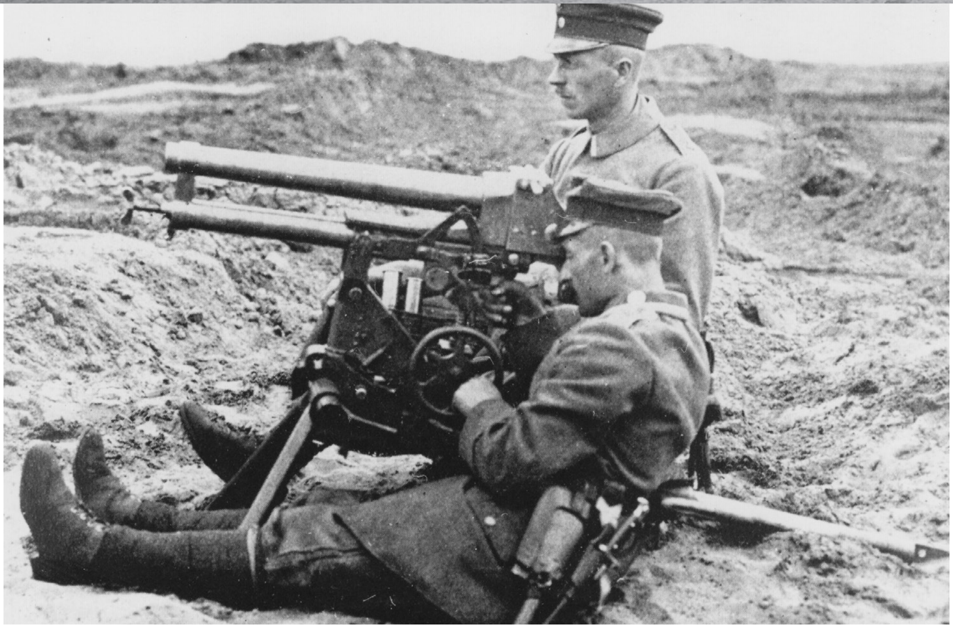
Firing tests results:

Range	Penetration
250m	25mm
560m	22mm
1,180m	16mm
2,000m	10mm

The 3.7cm Fischer TaK

The 3.7cm Fischer *Tankabwehrkanone* (TaK – tank gun) was considered to be a temporary solution to the lack of an efficient anti-tank gun. The TaK was produced by using the barrel of the 3.7cm *Revolverkanone* (revolver gun) trench gun, but this gun only fired high-explosive (HE) rounds; not ideal for anti-tank combat. Since the situation was critical, a quick decision was necessary, resulting in the weapon being ordered into production while a suitable armour-piercing (AP) shell was developed. The exact number of 3.7cm Fischer TaK sent to front-line forces remains unknown.

In mid-1918, Krupp and Rheinmetall were each contracted to develop anti-tank weapons, also using the barrel of the 3.7cm *Revolverkanone*. Apparently



Oberleutnant Fischer designed an interesting type of anti-tank gun; his main aim was keep the 3.7cm Fischer TaK as light as possible without loss in firepower. The weapon was transported into position on a simple cart, then lowered onto a tripod mounting. The war ended before the gun entered production.

these anti-tank guns did enter production and were sent to front-line forces.

An excerpt from memorandum dated 8 August 1918, the OHL notes:

> The T-Gewehr, which is now in service, has proven successful.

Assessment

Although the tanks introduced by the British and French forces during World War I were not a deciding factor in the outcome of the war, they certainly opened a new chapter in military technology. By July 1918, the French 10.Army had been equipped with more than 300 tanks, including the light and agile Renault FT-17 (with a rotatable turret), causing German forces to have problems holding their lines. A new attack by 500 British and 70 French tanks at Villers-Bretonneux achieved only limited success, but did shatter the morale of the German soldiers defending the frontline. In November 1918 many German soldiers who had become war-weary decided to refuse to obey orders, the first sign of the growing unrest that would eventually lead to the end of the German Empire. It was not the numerous smaller victories by western forces that finally decided the outcome of World War I, but more significantly the lack of German victories as the slaughter continued.

The tank had become the chosen weapon for any concentrated mass attack; the development of anti-tank weapons was a logical answer to this new threat. However, while the tank had solved the problem of mobility for Allied forces, the Germans had just begun producing their version of the tank – the A7V.

New weapons such as the T-Gewehr, although highly mobile, lacked the power to destroy a target and neither were the few anti-tank guns in service powerful enough to destroy enemy tanks.

Although the weapons used during World War I – tanks on one side, and anti-tank weapons on the other – were thrown into service without proper testing, the consequential technical and mechanical failures caused numerous problems for front-line troops.

However technical progress could not be halted; the race of 'armour versus ordnance' had only begun.

About the Book

To my knowledge, no comprehensive work on the German *Panzerjäger* has been published. Most available books or paperbacks dealing only with the weapons are aimed at a reader's special interest, such as *Jagdpanther* or *Hetzer*. Most deal only with the technical/mechanical aspect, supported by tabular material and photographs.

They seem to ignore history, which I think is unfair to those men who, in 1942, ducked in trenches awaiting an attack by Soviet tanks: A battle that would be fought with inadequate weapons.

My intention is to explain the historical roots of what was to become the *Panzerjäger*, and the development of anti-tank weapons – much of which was influenced by financial restrictions – during the inter-war period, through to the first deployments in the opening months of *Unternehmen* (Operation) Barbarossa.

In Volume II, I will deal with the beginning of the arms race between Germany and the Allies; in the first instant Russia and its great army. Beside the powerful guns and mighty tracked vehicles, I will also place a great emphasis on the work of the infantryman equipped in battle with the light 3.7cm PaK or the ubiquitous *Panzerfaust*.

When detailing battle action, I attempt to avoid any inappropriate, one-sided glorification, as this would despoil our memory of the many that died in this disastrous war. Memories recorded by veterans after the end of the war will be used to a very limited degree, as these can sometimes be biased or have become blurred by the passage of time. My preference, as always, is to use official after-action reports discovered during my many hours of searching through the files in various archives.

Thomas Anderson
Hänigsen,
January 2018

The Interwar Years

1

At the end of World War I, the arsenals of the victorious nations were well-stocked, and the tank began to be purchased by many armies around the world. In the west, armaments manufacturers increased production to meet orders for this 'revolutionary' new weapon. Among the most popular types was the Renault-built FT-17 light tank currently in service with the French army, and with it being small and cost-effective to manufacture, the type was sold to many foreign customers.

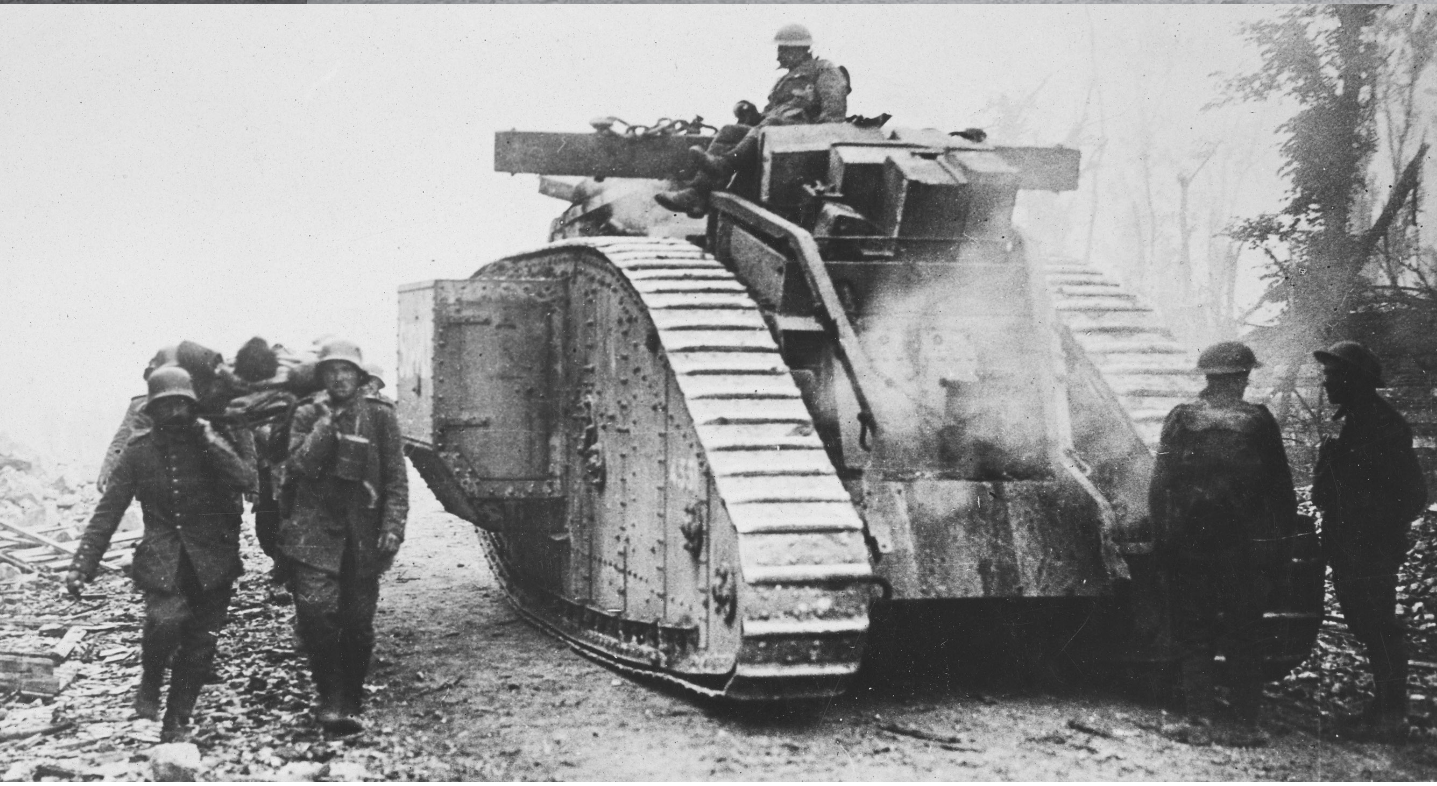
However, during the 1920s in Europe a form of disarmament had begun, as governments reduced spending on defence. Despite this, many armies began a programme of mechanization, replacing horse cavalry with armoured vehicles and tanks, creating what can be called a modern army.

With the introduction of the tank in World War I, military planners had to develop methods of defeating this menace on the battlefield. In Germany, the *Panzerabwehrtruppe* (anti-tank defence troop), armed with anti-tank weapons, was formed.

The Treaty of Versailles, signed on 28 June 1919, decided that Germany was solely responsible for the conflict and imposed harsh reparations. Not only were these applied to money and goods; the treaty also imposed severe restrictions on armaments. In 1920, the (restricted) 100,000-man German army was limited to having 52,000 handguns and a total of 156,000 rifles. It was also limited to having 1,000 anti-tank rifles, certainly not a sufficient number to defend the country.

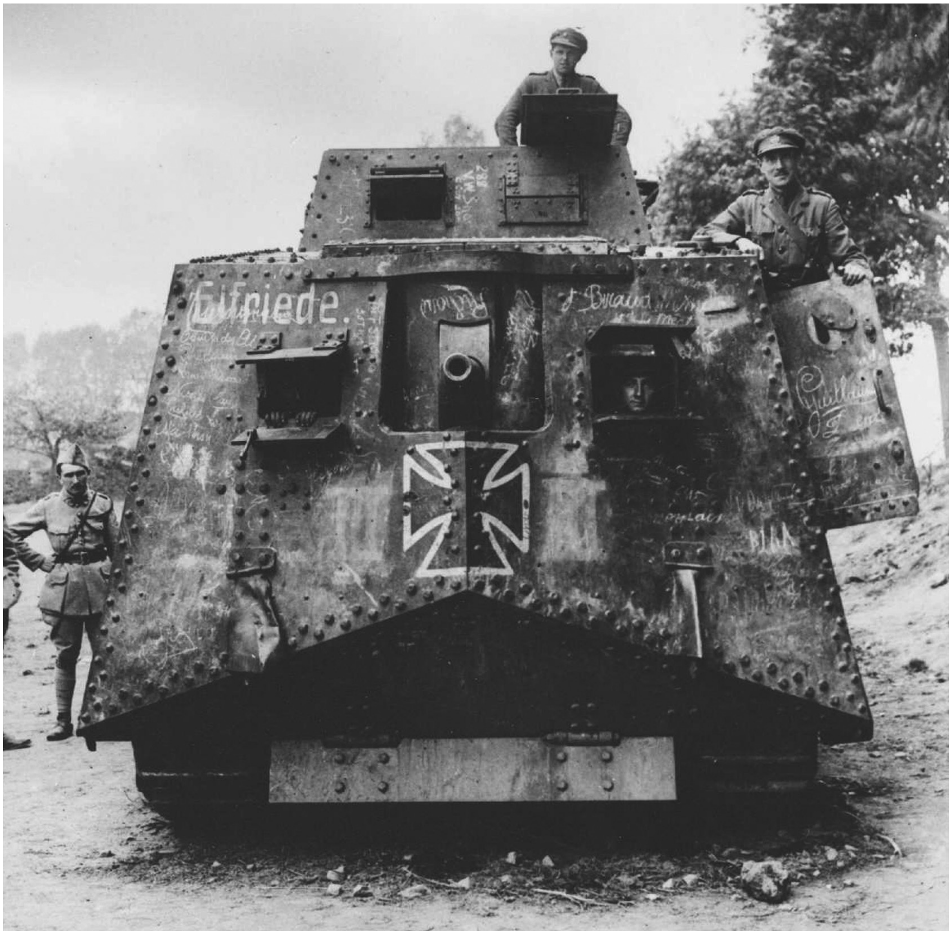
Possibly this was exactly what the signatories intended; a tragic fallacy. Instead of leading Germany into the circle of democratic nations, this questionable treatment humiliated the German nation, opening the door to extreme nationalism and for Adolf Hitler to seize power.

The rally of the Nazi Party was held annually from 1923 to 1939. Here the *Wehrmacht* (defence forces) demonstrate the fighting prowess of its various branches including those of the *Panzerjäger* (anti-tank force). The 1938 Nuremberg Rally was named as the *Reichsparteitag Großdeutschland* (Rally of Greater Germany) and ran from 5 to 12 September. (Getty)



Above: A group of German prisoners of war pass a British Mk IV tank parked in a French village. Although many of the attacks using tanks were not successful, their deployment did bring an end to the stalemate of trench warfare

Right: The German-built A7V was armed with a 5.7cm gun, but it arrived too late to combat the large numbers of British and French tanks. Number 524, *Elfriede*, was lost in action at Villers-Bretonneux on 24 April 1918, but was recovered by British troops.

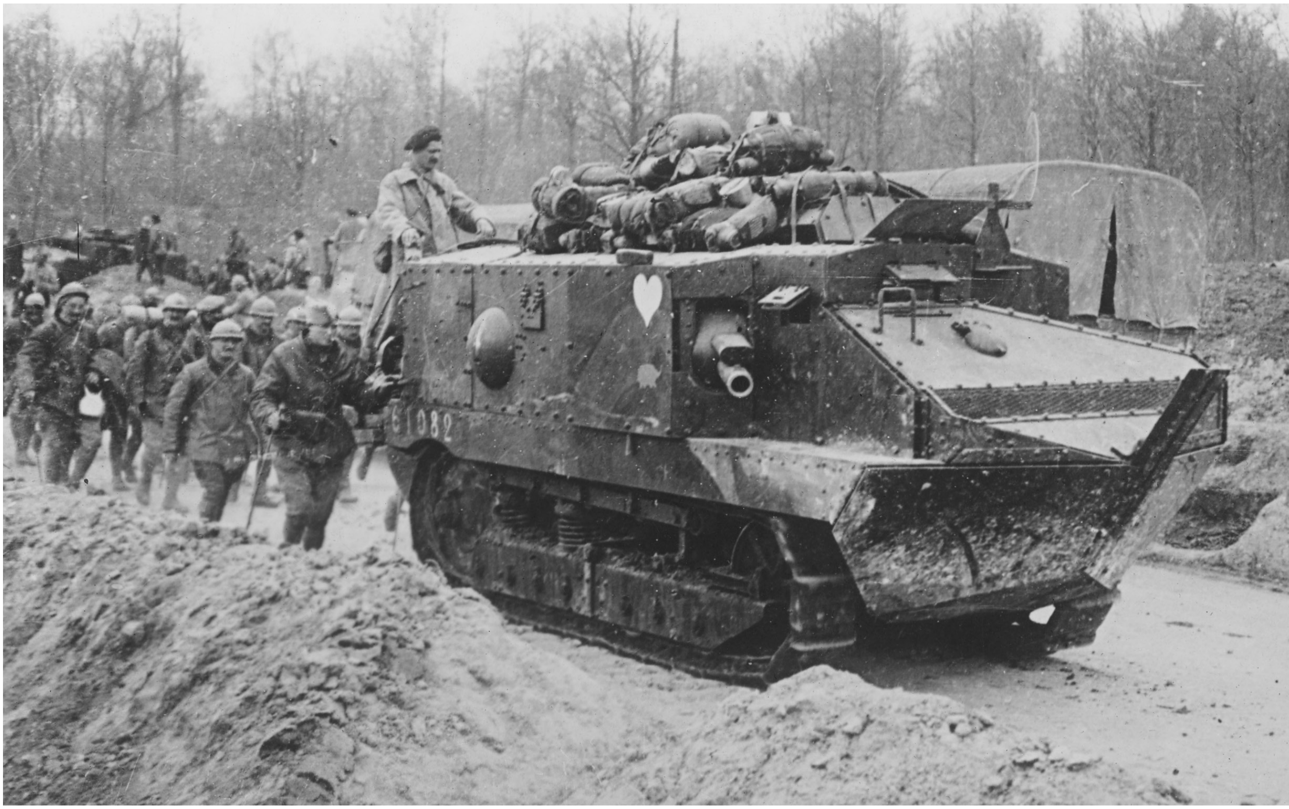


The Birth of the Tank

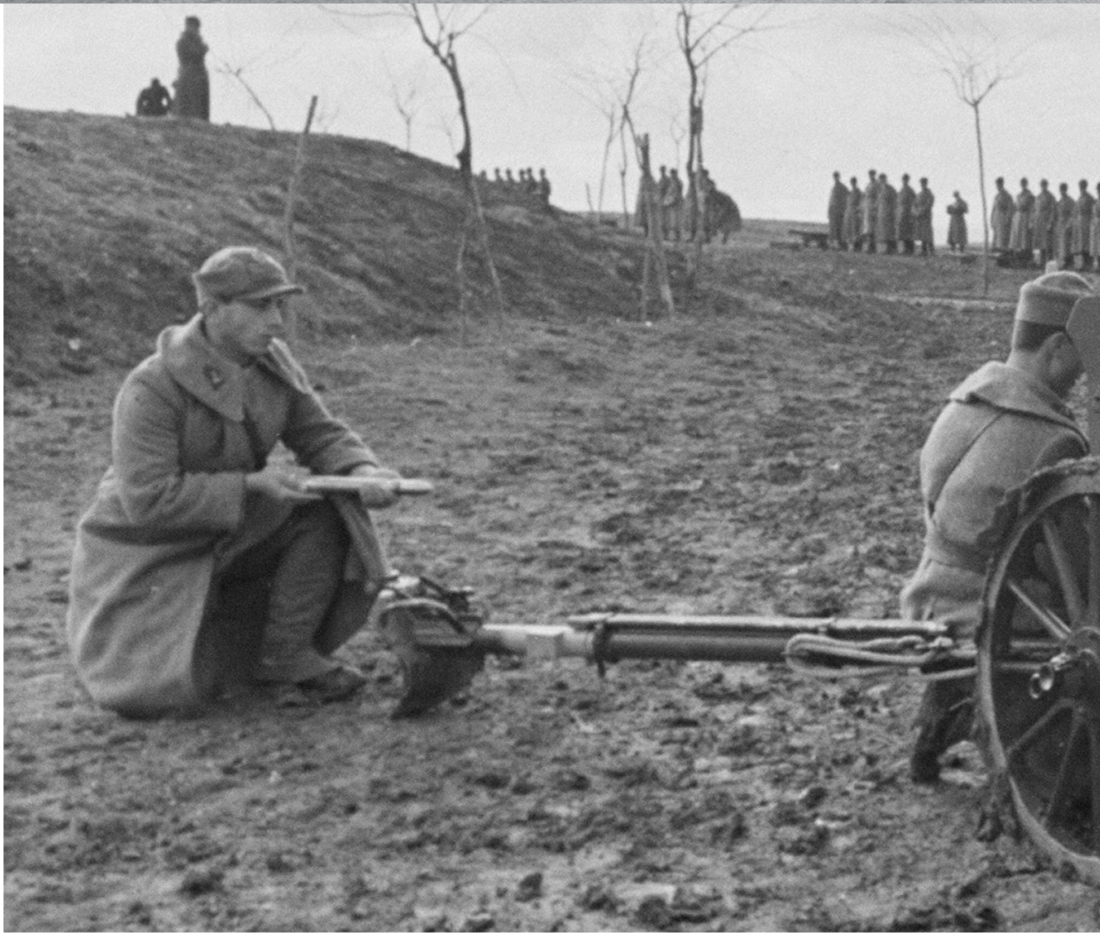
By using subterfuge and in great secrecy, from the mid-1920s Germany began to evade the harsh restrictions of the treaty and invest in the development of modern weapons. In 1926, Germany signed a neutrality and non-aggression pact with the Soviet Union. This allowed research and development work on tanks, anti-tank guns, aircraft and other weapons in complete secrecy at Kazan in the Soviet Union.

During the inter-war years, most of the developed nations had introduced tanks into their armed forces. Numerous large-scale manoeuvres allowed the mechanical performance and tactical deployment to be closely observed by the military attachés of foreign powers including Germany, which concentrated mainly on the forces of Great Britain and their arch-enemy France. The *Auslandsaufklärung* (foreign intelligence) kept a careful watch on all developments and a number of German officers, including Heinz Guderian, attended many of the exercises.

French forces were the subject of continuous and intense observation. Of particular interest was the development of anti-tank weapons and their projected performance against armour; also new types of tank and any other



In February 1916 the French military ordered 400 of the Schneider CA1, all of which were built by their subsidiary company, SOMUA. It was armed with a 75mm gun mounted in a side bay which severely limited traverse. The type also had other problems; it caught fire easily and the simple Holt-type suspension gave poor cross-country mobility.



In 1925, German military planners, using experience gathered during World War I, ordered development of a 37mm anti-tank gun. This highly secret work resulted in the Rheinmetall 3.7cm *Tank Abwehr Kanone* (TaK – tank defence gun). It was mounted on a carriage fitted with wooden-spoked wheels as it was intended to be horse-drawn. In the early 1930s, the 3.7mm TaK gun was exported to a number of nations, including Turkey. (Getty)

weapons. However, it is a known fact that German intelligence was not particularly effective.

During World War I, German forces had entered uncharted territory after their first encounter with British armour. Their first response was to use the light field artillery to repel the attack, and although this helped it was not completely effective.

The development of more effective defensive weapons would be thwarted due to a number of factors. The initial task of creating a specification for a light, mobile and effective weapon was complex and made even more difficult by poor decision making by old, outmoded officers who lacked vision. The T-Gewehr anti-tank rifle and the early 3.7cm nti-tank gun entered service in late 1918, but were not available in sufficient numbers and were delivered too late to have any effect on the battlefront. After World War I, the T-Gewehr would be the only anti-tank weapon available to German forces.

Between 1925 and 1930, the development of ‘modern’ German anti-tank weapons really began, despite the severe restrictions imposed by the Treaty of Versailles and the financial problems which arose at the end of the decade.

The 3.7cm TaK

In February 1926, using experience gained during World War I with both the 3.7cm Fischer and Rheinmetall anti-tank guns, the *Inspektion für Waffen und Gerät Abteilung* (WaPrüf – weapons and ordnance inspectorate) 4 issued a detailed specification for a 3.7cm weapon:

> Specifications for the *Sonderlafette* [special carriage] for the 3.7cm TaK L/45:
>
> The gun is a *Tankabwehr-Kanone* [anti-tank defence gun]. It must fire tracer shells capable of penetrating high-quality 40mm armour plate at an angle of 30° from the vertical at a range of 500m. The shell should have sufficient fragmentation to knock out the crew inside the tank. In special situations it should be able to combat ground targets such as a machine gun protected by a gun shield. The vehicle must be easy to manoeuvre, allowing it to follow the infantry over all types of terrain.

> The 3.7cm L/45 gun barrel is already available. The wheeled carriage for horse- or crew-towing should be capable of being disassembled for transport by men or pack animals. Long split trails will prevent the gun from skidding when firing at 0°. Elevation is -5 to +15° with a traverse of at least 20° to both sides. The profile of the gun is to be kept as low as possible. The gun shield (approximately 4.5mm thick) should be able to stop sS [7.92mm lead] bullets. Total weight in position should not exceed 250kg.

[Modern weapons fired a wide variety of bullet types. The most widely used was the *Spitzgeschoss* (S-Geschoss – pointed bullet). A modification with enhanced impact was the *schweres Spitzgeschoss* (sS Geschoss – heavy pointed bullet). The *Spitzgeschoss mit Kern* often had a tungsten core.]

After an evaluation, the armaments manufacturer Rheinmetall was chosen to develop and produce the new gun. It was designated 3.7cm TaK (*Tankabwehr-Kanone*) and entered service at the beginning of 1928.

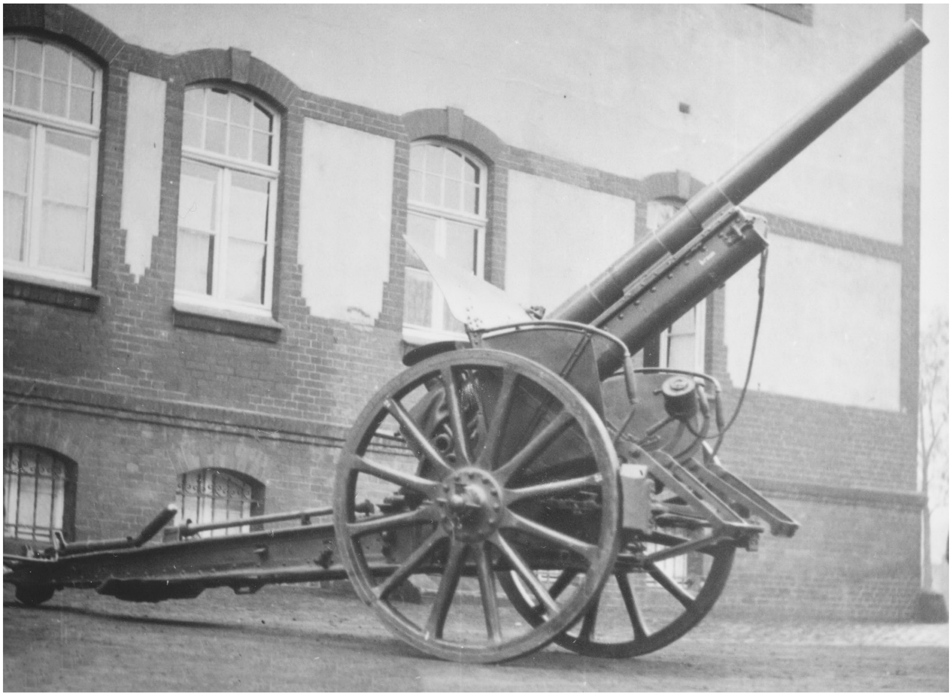
The design of the gun was conventional, but examination of contemporary photographs shows that the first versions were fitted with gun barrels of different lengths: a standard L/45 with a length of 1,665mm and a slightly longer L/60 version. The latter did not enter production, possibly because it did not give a significant improvement in performance. As with all German artillery, it was fitted with a horizontal-type sliding breech.

The gun was mounted on a split carriage, designed for horse-drawn transport and fitted with steel-tyred wooden wheels. It was considered important that the crew could manually move the weapon over short distances in the field to change firing position.

The gun was supplied to the *Reichswehr* at a slow rate due to the fact that this had to be performed under secrecy, and the critical financial situation in the Reich. On 20 October 1932 the *Wehramt* (weapons office) confirmed that 264 new 3.7cm TaK were to be delivered to the army.

A Heavy Anti-tank Gun

Beginning in 1926, Krupp and Rheinmetall also worked on more powerful solutions. The barrel of the 7.5cm *Gebirgsgeschütz* (mountain gun) and that of the 7.7cm *Feldkanone* (Fk – field gun) 96 *neue* Art (n A - new model) promised to offer far superior penetration performance when compared to the 3.7cm TaK. Due to the heavy weight of these guns, trials were carried out simply by mounting a number on the chassis of a commercial fully-tracked tractor: The forerunner of the *Selbstfahrlafette* (self-propelled gun) of World War II.



The 7.7cm Feldkanone (Fk – field gun) 16 was developed from the 7.7cm Fk 96 *neue Art* (nuA – new model). During establishment of the *Reichswehr*, the gun was replaced by the more powerful 10.5cm *leichte Feldhaubitze* (le Fh – field howitzer) 18. Had the Fk 16 remained in service, Germany would have been able to establish a heavy anti-tank defence force long before World War II.

In 1930, even the chassis of a *Leichttraktor* (light tank), which had been developed in secret at Kazan, was being evaluated as a carrier for the 3.7cm TaK. Although an interesting approach by utilizing the great mobility of the tank, the project was not progressed.

It should also be noted that whenever possible German armaments manufacturers, following those of Switzerland, made concerted attempts to export their products to other nations. For instance, after Germany regained full military sovereignty in 1935, Krupp and Rheinmetall made concerted efforts to increase their amount of foreign business.

Modern Anti-tank Defence

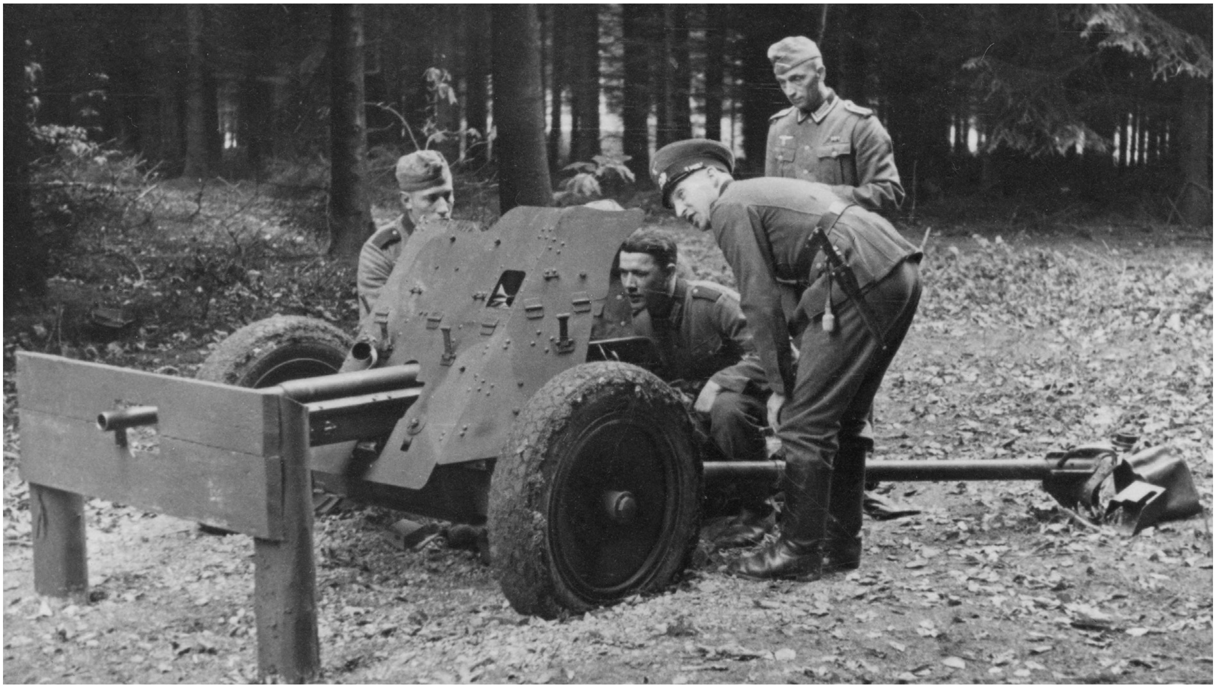
During the period of mechanization, the tactical deployment of modern weapons such as the tank and anti-tank gun was carried out more in theory than by using any previous practical experience. The German army of the 1930s was forced to gain experience by observing the tactics used by foreign armies and from their own military manoeuvres despite lacking suitable equipment.

On 12 September 1932, Inspection 6 (at that time responsible for motorization) submitted an interesting report:

Attached we submit a report made during the exercises with dummy tank battalions at Grafenwöhr and Jüterbog:
Experiences in defending the tanks

2.) The infantry is, including its machine guns, helpless against tanks. For this reason the infantry will allow enemy tanks to roll over them, and will immediately resume the fight against enemy infantry following behind the tank attack.
5.) All weapons suitable for fighting enemy tanks will be used: light mine throwers, infantry guns, artillery, and the *Division-Tankabwehr-Kompanie* [DivTakAbwKp – divisional anti-tank company].
7.) The commitment of infantry guns in the front of the main line of defence is not sensible, since the dug-in guns will be overrun in a surprise tank assault. It seems to be more sensible to position them to the rear of the zone of resistance. It remains questionable as to whether the horse-drawn tank defence platoon should be used with the infantry battalion. However, this also seems to be unlikely since a tank attack will proceed too quickly.
8.) The artillery will combat recognized enemy assembly areas, and then the tanks approaching the zone of resistance by indirect fire.
9.) The DivTakAbwKp is the prime defence weapon against a tank assault, and is at the disposal of the [infantry] division.
13) Facing superior numbers of enemy tanks, the concentrated deployment of the company is necessary to achieve any success.

A line of horse-drawn, *leichte* (light) and *schwere* (heavy), *Minenwerfer* (mine thrower) during a parade: this type of weapon was used by most nations. Although originally intended for trench warfare, the weapon could also be used to attack enemy armour. The type was superseded by the much more mobile grenade launcher.



During the motorization phase initiated in mid-1935, the 3.7cm TaK was fitted with pneumatic tyres and re-designated as a 3.7cm PaK.

This analysis of an early *Reichswehr* manoeuvre using dummy tanks shows a great degree of uncertainty among the leadership, resulting from their total lack of experience of deploying modern weapons. The term *Tankabwehr* or *Panzerabwehr* (anti-tank defence), which originated in World War I, presented in this context a more or less passive approach to the tank problem. The report demands the creation of a defensive front to intercept enemy tanks before they reached the frontline. This was simply a static tactic, caused in the first instanced by the poor mobility of the horse-drawn anti-tank guns. But now mobility had been recognized as being a decisive factor; the German military authorities now began to actively seek a workable solution to the problem. However, the realization would take more time.

At that time limited numbers of the 3.7cm TaK were already in service with the still horse-drawn forces.

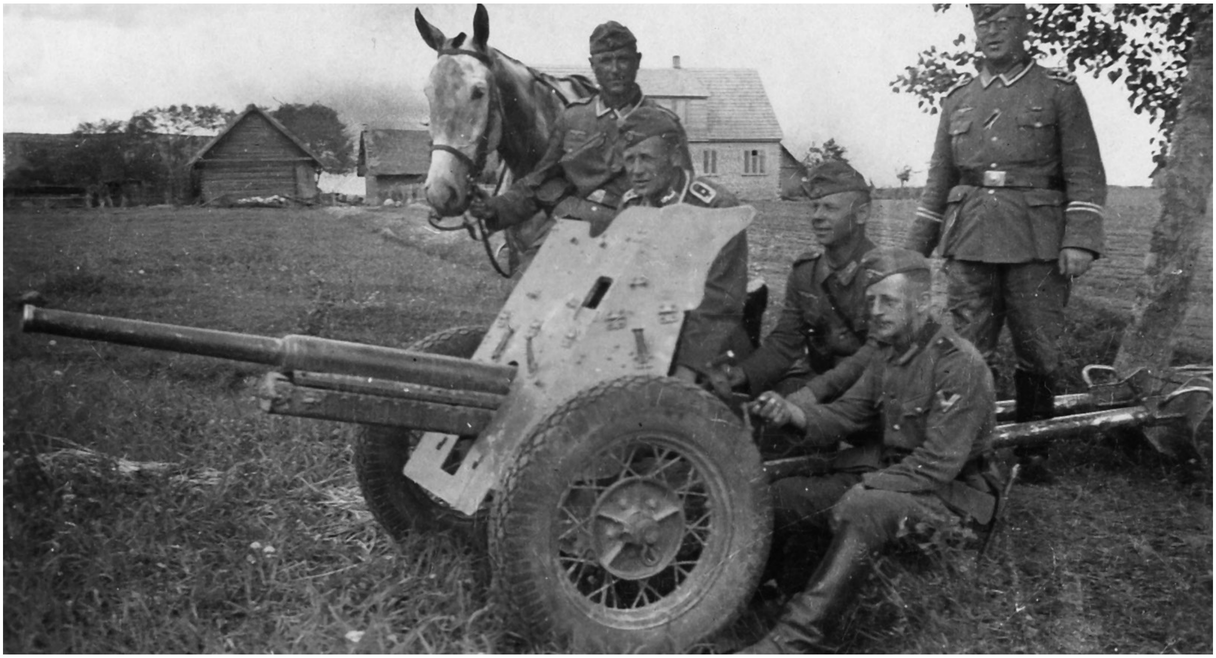
In August 1933, the *Inspekteur der Kraftfahrtruppen* (inspector of motorized troops), General Oswald Lutz, sent a memorandum to the *Wehramt*, stating his attitude towards mobility:

> Expansion of motorized forces
>
> The greatly increased impact of modern firearms has broken the offensive power of the 1914-style armies. The new German *Reichsheer* [*Reichswehr*, after

> The Treaty of Versailles] was established according to the earlier pattern, and not allowed heavy weapons. Thus it lacks any offensive power. Facing the modern equipment of her neighbours with aircraft, tanks and heavy artillery, the army does not even have sufficient defence forces. The numerical inferiority imposed on us will increase these problems, making even a defensive war a hopeless task.
>
> I believe it is my duty to make suggestions… to find a compromise. These claims are noted in the development programme of the *Truppenamt* [cover name for *Generalstab des Heeres* [GenStbdH – General staff of the army].
>
> Of utmost importance is the requirement for operational and tactical mobility for the army and a maximum increase in our offensive power.
>
> Superior operational mobility can compensate our numerical inferiority. Only operational mobility will give freedom of action.
>
> Efficient utilization of the railway network and the motor vehicle for transport and support duties is vital to the highly mobile combat units to allow them to continue attacking the flanks and rear of the enemy.
>
> The cavalry is unable to perform this task.
>
> The tactical mobility of each individual weapon must be increased… at the moment the motor vehicle is underexploited.
>
> Particular attention must be paid to protection against tank attacks, which are increasingly available in the armed forces of all nations, except Germany. The best protection and the best defence would be a counterattack by our tank forces in comparable strength, but this will not be feasible in the foreseeable future. Thus, the number of defensive weapons must be increased and motorized.
>
> The number of anti-tank guns issued to motorized units engaged on the frontline should be increased moderately, since it is almost impossible to halt a tank assault in front of our line. On the other hand the anti-tank defence unit, being at the disposal of the divisional commander, should certainly be considerably strengthened. For the above-mentioned reasons we need to form more fully equipped anti-tank companies.

In this phase of uncertainty General Lutz underlines the value of motorization and the tank for future conflicts. Although faced with the restrictions of The Treaty of Versailles and the dire economic situation in Germany, he continued to demand his requirement for small, agile tank formations capable of outmanoeuvring a numerically superior enemy (tank) force. In essence this was a call for the formation of the tank brigade rather than a full-scale division; both were evaluated in the late 1930s.

The call for an expansion to the divisional anti-tank defences was necessary because of a virtually non-existent German tank force. Also it was vital for the infantry to have a defence against a tank attack.



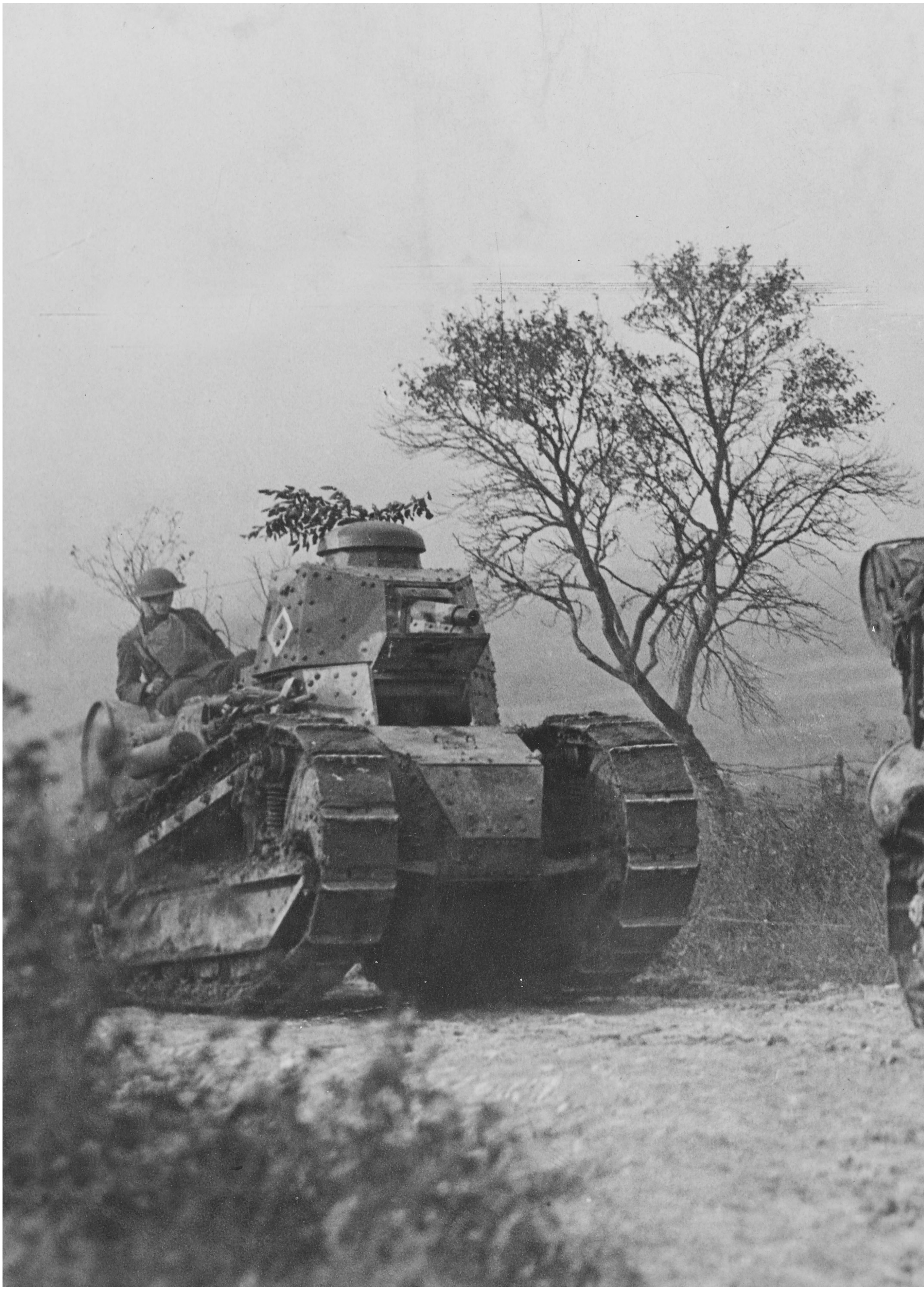
During the period of military cooperation between Germany and the Soviet Union, armaments manufacturer Rheinmetall was allowed to license production of the 3.7cm PaK to the Russians. However, after a number had been built, the Soviets designed and began producing their own 45mm anti-tank gun. This particular gun was captured during the first months of Barbarossa: the similarity to the 3.7cm PaK is obvious.

The situation changed a few months later when the supply of suitable motor vehicles reached a level which made trial establishment of the first full-scale tank division possible: 1.Panzer Division (PzDiv). Between 1935 and 1936 more tank divisions were formed.

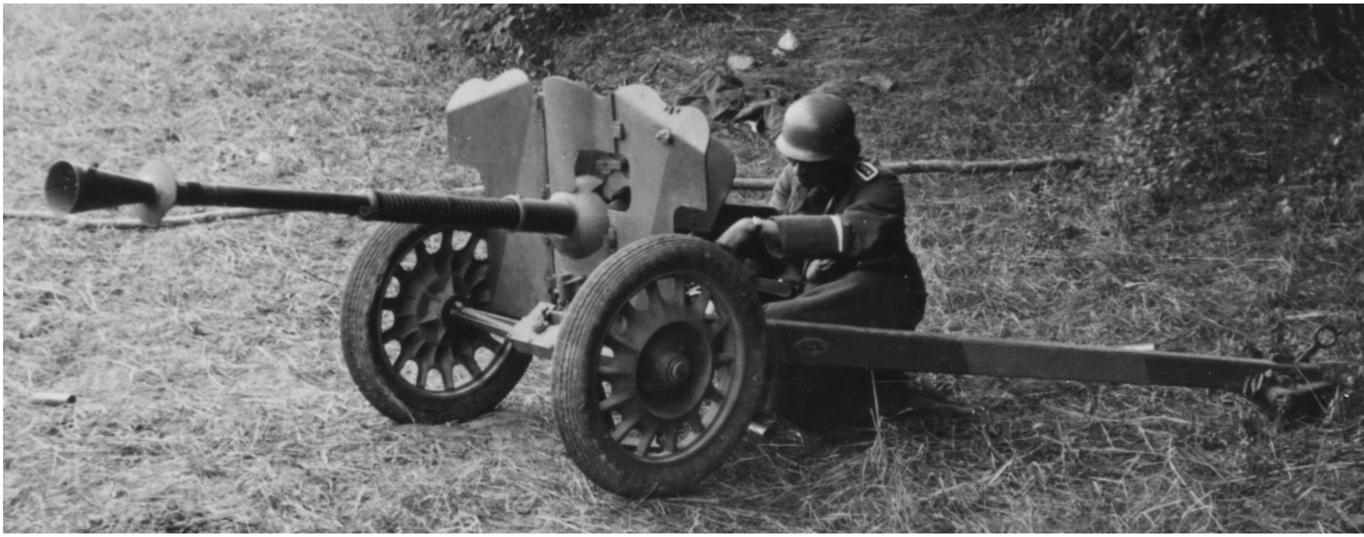
1935 – Offensive Anti-tank Defence

In October 1935, General Lutz ordered a fundamental reorganization of the *Reichswehr* for what was to become the German army of World War II. If Germany was to have an effective fighting army, crucial action had to be taken. The establishment staff officers for the first three Panzer divisions had been only recently appointed. Optimal strength for each unit until 1937 was 140 tanks armed with a 3.7cm KwK L/45 and ten tanks armed with a 7.5cm KwK L/24, but this was not achieved due to delivery delays from the manufactures. Instead, the tank divisions had to initially be issued with the LaS (PzKw I) armed with a machine gun, and then at only a very slow pace. In consequence, the ambitious target for 1937 demanded by Lutz could not be achieved: Neither were they by 1939.

Lutz also demanded a reorganization of anti-tank defence for the infantry, but apparently, taking the present supply situation into account, he decided that complete motorization was not a pressing necessity:



In 1918 the Renault FT entered service with the French army, and was the first tank to be fitted with a rotatable turret; a feature that would influence the design of all future tanks. Being small, the tank was relatively inexpensive to build and this resulted in it being mass produced; large numbers were sold worldwide and also produced under licence.



In 1934, the *Canon léger de 25 antichar SA-L mle* 1937 (25mm anti-tank gun) entered service with the French army. The gun proved to be capable of defeating lightly armoured enemy tanks at a maximum range of 600m.

Subject: Establishment of new motorized anti-tank defence companies for the infantry.

1) To the hon Commander-in-Chief of the army
According to the present situation, it is planned to establish nine motorized *Panzer-Abwehr-Kompanie* [PzAbwKp – anti-tank defence company] in each infantry regiment as their 14.Kompanie [Kp - company]. We finally agreed on the necessity of mobilizing these new companies. However, parts of the infantry have rejected motorization. I also do not feel the need to provide these companies with motor vehicles.

Reasons:
A 14.Kp has the task of providing immediate protection for their infantry regiment in combat, on the march and during periods on stand-by.
In combat, the defensive weapons have to be ready in their firing positions. Consequently, I see no reason to issue motor vehicles to get the guns into position. Thus horse-drawn transport or manual movement by the crew is absolutely sufficient.
On the march, the anti-tank weapons have to be ready to ensure the immediate protection of the regiment.
For protection during stand-by periods motorization is not necessary. In my opinion, motorization of the tank-defence guns for the infantry carries risks. One disadvantage is the fact that it is difficult, if not impossible, to integrate mobile units into a column of marching infantry. This would require the development of specialized vehicles capable of being driven at slow speed over long distances: that is out of the question. Furthermore, motorization would have to be limited due to

> the erratic supply situation.
>
> Therefore, I advise that it is not necessary to provide the 14.Kp of the infantry regiments with motor vehicles, but horses instead.

The points made by Lutz appear to be conclusive and would have set the benchmark for mobility – or lack thereof – for front-line infantry in the future. Furthermore, two types of tank defence companies would have been established; the horse-drawn 14.Kp of the infantry regiments (a total of three per infantry division), and the motorized tank-defence companies of the divisional *Panzerabwehr-Abteilung* (PzAbwAbt – tank defence battalion), directly subordinated to an infantry division.

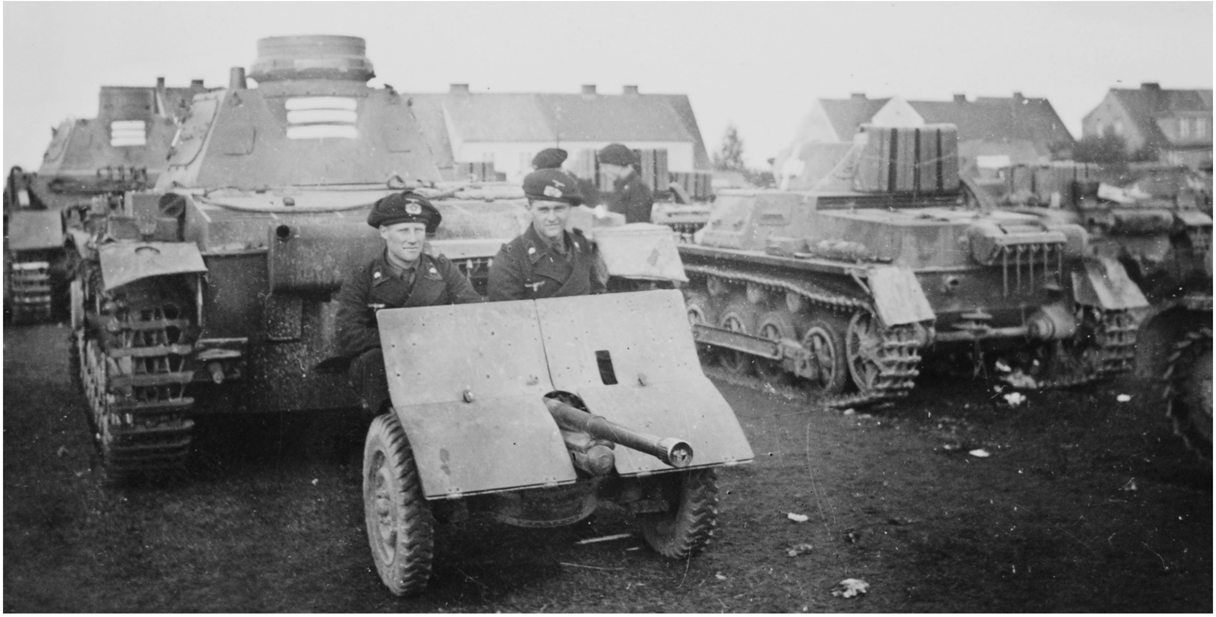
A week later, 4. Abteilung approved:

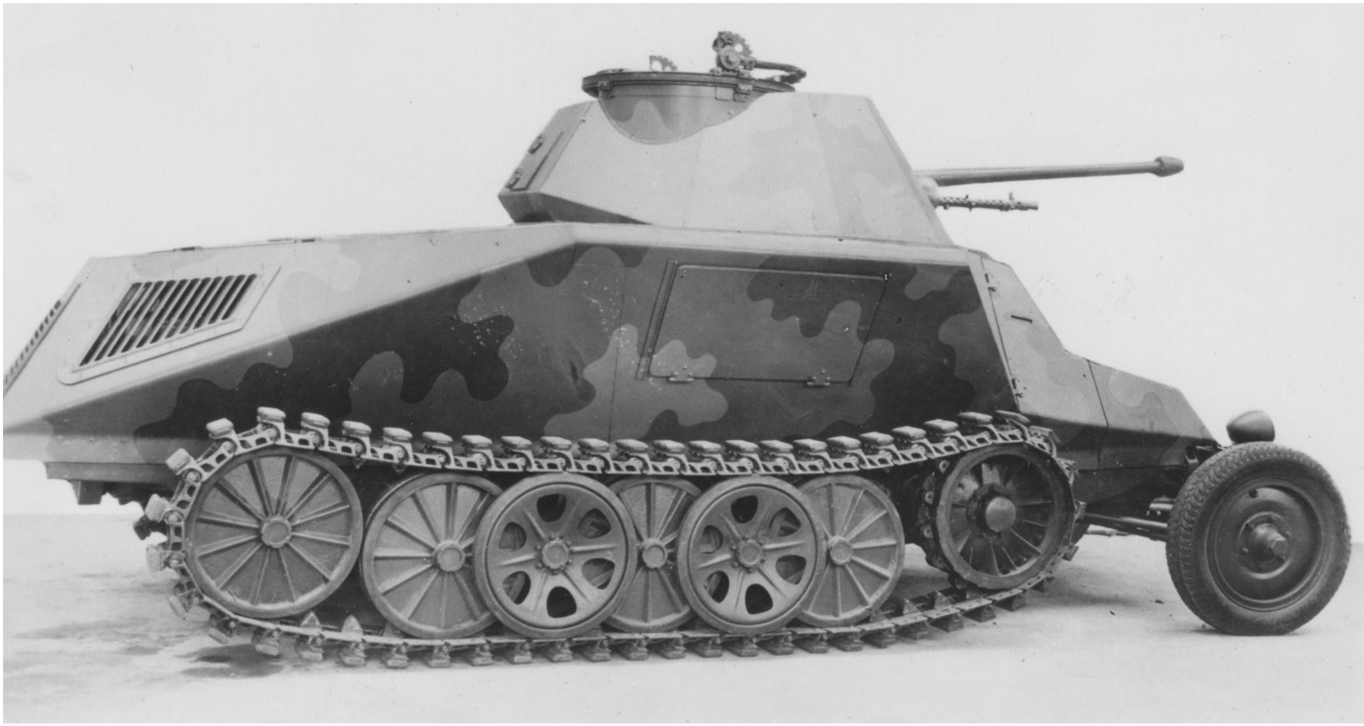
> 4.Abt supports the proposal of the inspector for the motorization of the army. The *Infanterie-Panzer-Abwehr-Kompanien* [InfPzAbwKp – infantry anti-tank defence company] should be horse-drawn rather than motorized.

However, the general staff of the army unequivocally rejected the proposal. At the end of 1935 the following decisions were made:

> I. Anti-tank weapons of the infantry regiments
>
> 1) The 3.7cm PaK must continue to be the main weapon. It has sufficient penetration power to defeat the majority of all emerging tanks, except heavy

Before the German invasion in 1939, the Polish army had been equipped with the 37mm wz.36 anti-tank gun. The gun was a development of the Swedish-built Bofors, which had been exported to a number of nations. This particular gun was captured during the Polish campaign, and is being towed by an early PzKpfw III.





During the 1930s, Germany began the development of a number of revolutionary tank destroyer types. The *Tankjäger* (3.7cm Sfl L/70) used a Hansa-Loyd half-tracked chassis mounted with a lightly armoured body. Although the vehicle had good mobility on and off road, it did not enter production.

types. A further increase of penetration power is possible only by lengthening the barrel. This is not desirable, since the gun will be used on the frontline. A reduction in calibre to 2cm, to standardize with the weapons of the anti-aircraft defence, is out of the question because of the loss of performance.

a) We suggest an increase in the number of guns in each PzAbwKp from 9 to 12 guns.

b) Motor vehicles will be retained, rejecting the proposal of the inspector of army motorization. The vehicles used until now can be replaced by *Liliputschlepper* [agricultural tractor], which has excellent cross-country mobility and is slow enough to follow marching infantry.

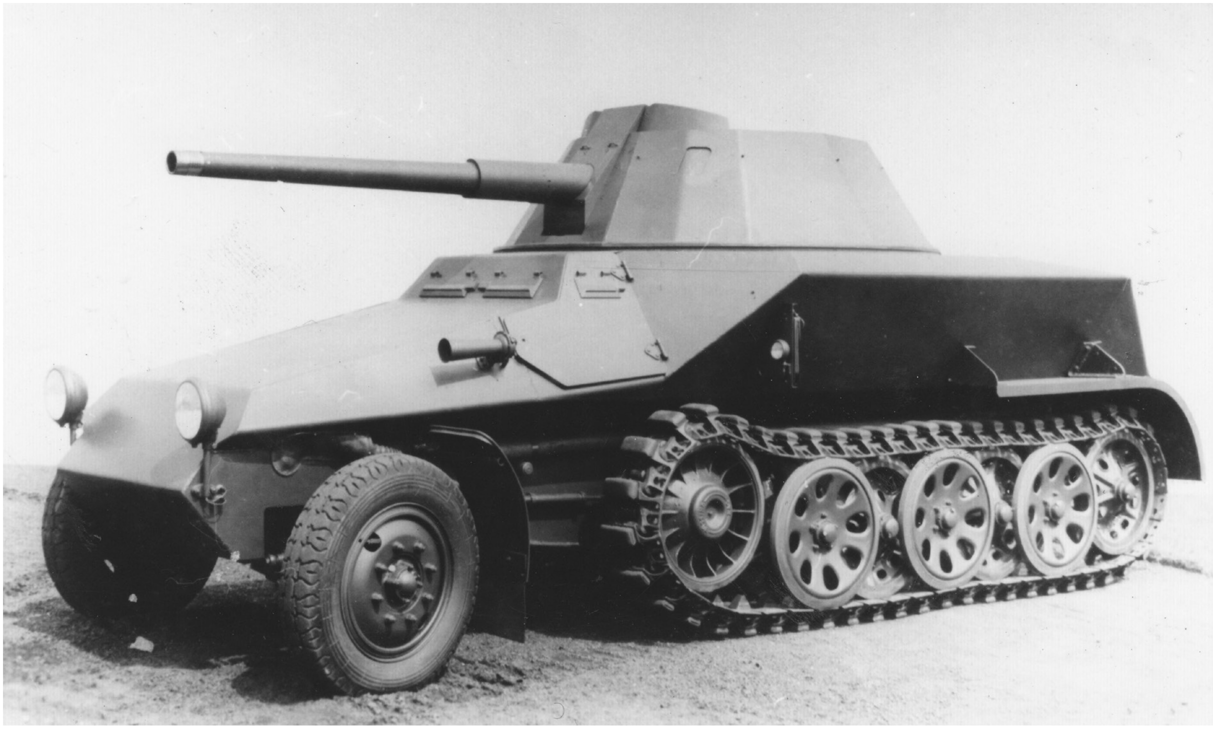
2.) Improving the infantry small arms anti-tank defence.

a) Usage of *Wolframgeschosse* [tungsten rounds], able to penetrate the plating of armoured cars and light tanks at ranges of 300m.

II. Anti-tank weapons at the disposal of higher army levels.

1) Initially the 3.7cm gun will remain. After application of item I a.) the division will dispose of over 72 anti-tank guns. To improve mobility, the 3.7cm gun must be modified to *Panzerjäger* standard using a light armoured chassis.

2 The further development will result in a transition to heavier weapons, 5cm and 7.5cm anti-tank guns on *Selbstfahrlafette* [Sf – self-propelled (SP)]



A heavy *Tankjäger* was built which mounted the 7.5cm Fk 16 L/40.8, in an open turret, on a chassis developed from the SdKfz 6 half-track tractor. Potentially, the type would have been an effective tank destroyer, but it was too expensive to produce and did not enter service.

> chassis. The 7.5cm gun will be used to defeat super heavy tanks only.
>
> 3) The goal is to achieve a PzJgAbt for every division, which should partly dispose of 5cm guns on SP chassis.

These far-reaching plans are comprehensive, but could not be realized in full until the beginning of World War II. The following note written by *Waffenamt* (ordnance department) officials on 30 October 1935, exemplifies the great degree of uncertainty among the general staff and lower departments:

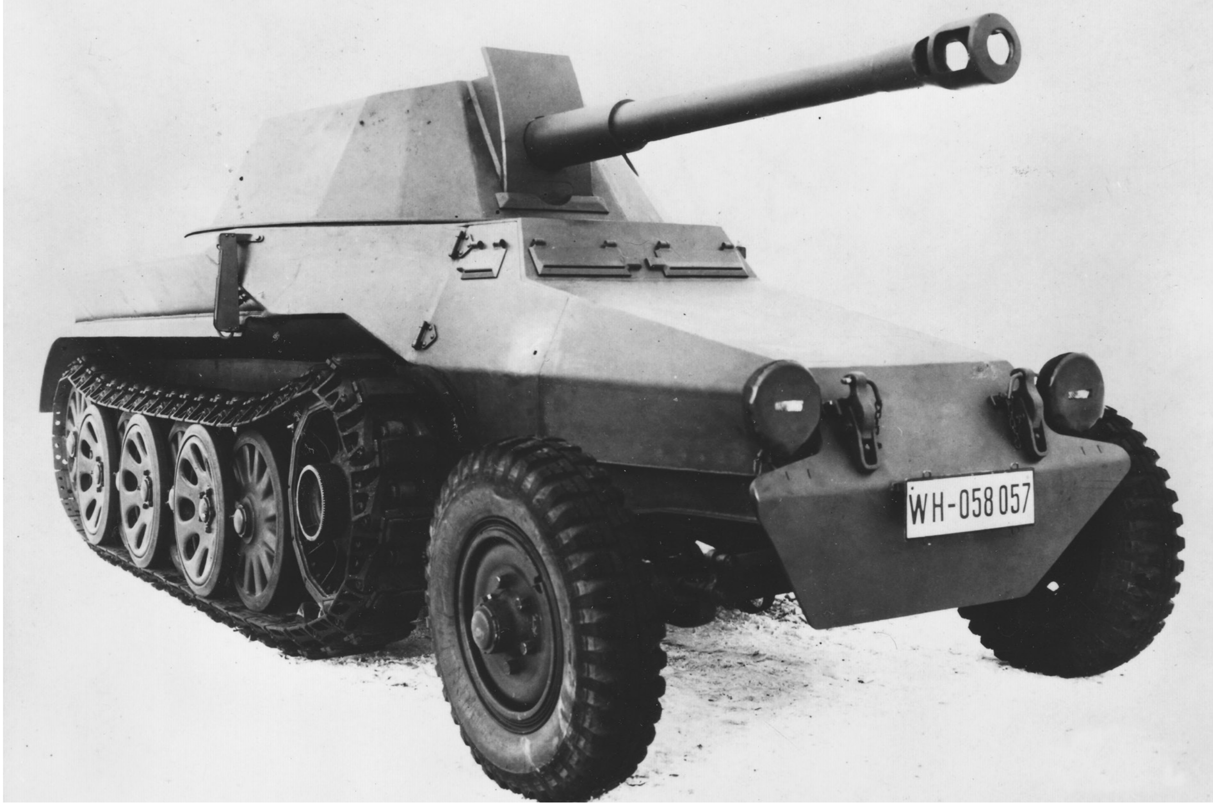
> Offensive defence of tanks:
>
> During the demonstration at Kummersdorf, the honorable Commander-in-Chief of the army emphasized to a small circle of officers that an offensive anti-tank defence must be achieved.
>
> Intelligence reports speak of an estimated 1,000 French tanks entering service recently, fitted with improved armour of 40mm. We have to react regarding our technical developments.
>
> The often-stated principle that if the greatest adversary for a tank is another tank, then the most agile tank will be the best defensive weapon, is somewhat controversial.
>
> A heavy bomber will not be attacked by another heavy bomber, but by a

> faster, more agile fighter aircraft. At sea the torpedo-boat will be fought by the torpedo-boat destroyer. Both share the fact that they are small craft having superior speed and agility. Armour protection is only necessary if speed and agility is compromised.
>
> Bearing in mind these examples, the question arises as to whether a *Tankjäger* (tank hunter) could defeat heavy armour if built to the following requirements:
>
> a) A very high road speed to achieve a good operational mobility
> b) Excellent cross-country mobility comparable to that of a tank
> c) A high off-road speed and better agility than a tank
> d) A low profile to present a small target
> e) A stable gun platform
> f) Lethal firepower at ranges up to 700m
> g) Be inexpensive and quick to mass produce in comparison to a tank
> h) If possible, the gun must be quickly dismountable from the carrier
>
> To achieve the above many problems have to be addressed with regard to the selection of a suitable chassis and technical upgrades to the weaponry.
>
> In regard to the weaponry; the highest possible armour penetration in conjunction with low recoil must be achieved. A possible solution would be to fit the gun with a high-performance muzzle brake, or by utilizing the rocket effect would result in practically recoilless weapon. Further questions arise, which have to be answered:
> a) At what stage are those suitable tanks and armoured cars available or in development?
> b) Are the self-propelled armour-piercing weapons under development suitable?
> c) Is it possible to utilize the available TaK, with modifications if necessary, for an offensive anti-tank defence?

This intelligence report dealing with the modernization of the French tank force was accurate and up to date as the Renault R35 and Hotchkiss H35 were mentioned. The prospect of being confronted by 1,000 tanks fitted with heavier armour must have been daunting to the founders of the German tank force.

The comparison of warfare on land at sea or in the air appears to be fanciful or implausible to the military mind due to its simplicity, but understandable to others such as politicians and bureaucrats.

The report continues summarizing currently available equipment. Both the PzKpfw I and PzKpfw II, which had just entered production, were considered to be useless against the new French tanks. Even the 3.7cm (KwK or PaK) L/45 gun mounted in the Zugführerwagen (ZW) – later PzKpfw III



The improved version of the heavy *Tankjäger* featured a number of modifications, including: the 7.5cm Fk 18 L/40.8 gun was fitted with a muzzle brake to improve ballistic performance; the turret and superstructure were refined; and the suspension was slightly modified. Although vehicle trials continued in 1940, the type did not enter production.

– lacked sufficient firepower. The report also requested that a more effective ammunition round and a muzzle brake be developed for the 3.7cm L/45. Also, work on a new longer-barrelled 3.7cm L/65 gun was demanded. However, having in mind the limited efficiency of the 3.7cm gun, the *Waffenamt* requested the urgent development of a 5cm gun. This was seen as critical, but to mount the gun in a PzKpfw III a new turret would have to be designed and this would require a larger diameter turret ring. The resulting tank would have been larger and heavier than its predecessor. (In fact, the PzKpw III mounting a 5cm gun entered service after the French campaign.)

It proved impossible to make improvements to the PzKpfw III in the short term, and the proposal to manufacture a new version of the 3.7cm gun was cancelled. The report noted that ammunition for the new gun would not be compatible with the only recently introduced 3.7cm TaK L/45, another reason for the decision.

The report even refers to the SdKfz 222 and SdKfz 231 *Panzerspähwagen* (armoured cars), both of which were under development at the time and armed with the 2cm KwK 38 cannon. Although having effective machine-guns and light cannons, the *Waffenamt* identified the same drawbacks as when a machine-

The 3.7cm PaK entered service in the late 1930s as the standard anti-tank gun for all German military formations. The light weight (435kg) gun was purposely designed to allow a gun crew to move it around the battlefield without a towing vehicle. (Getty)

gun armed PzKpfw II engaged a heavily-armed and armoured French tank. The report carries on listing sophisticated weaponry:

> As for b)
> Vehicles possibly suited as a *Tankjäger*
>
> 1) 3.7cm TaK on *Selbstfahrlafette* carriage (le gl ZgKw) [light cross-country tractor unit mover, based on the prototype of the later SdKfz 11].
> Realizing the poor cross-country mobility of the introduced 3.7cm TaK, WaPrüf commenced development of a SP TaK weapon some time ago. The high speed on road (more than twice that of a tank) will allow for rapid transfer to battle areas; it even has a superior off-road mobility. The armour protection is similar to the *leichte Panzerspähwagen* [SdKfz 222 – light armoured car], most likely it will be safe against armour-piercing bullets. The first prototype will be available in early 1936.
> 2) 7.5cm *Kanone* on self-propelled carriage
> With regard to defeating the most heavy Franch tanks (2C, 3C and D), the hon Commander-in-Chief of the Army has ordered development of a 7.5cm gun on a SP carrier. This gun has the performance of the FK 16 nA and with a muzzle velocity of 650mps an armour-piercing round will penetrate 61mm at an angle of 60° and a range of 700m. A first prototype will be available by early 1936.

3) 5cm TaK on SP carriage
Since the 7.5cm SP gun will be too heavy and too precious to be used only for tank-defence, the development of a 5cm SP TaK has to be considered. The costs of a respective prototype can be covered by the evaluation funds.
4) 2cm FlaK SP gun (le gl ZgKw) (later the SdKfz 10/4)
This gun has been developed for the anti-aircraft troops, but can be used for the anti-tank defence with limited success.
5) 3.7cm FlaK18 SP gun (le gl ZgKw) [SdKfz 6/1]
This weapon has been delivered to the anti-aircraft troops. It has slightly better armour-piercing performance than the 3.7cm TaK L/45.
6) The *Achtradwagen* [SdKfz 233/231], mounted with a TaK.
The first chassis of this heavy armoured reconnaissance car mounting a 2cm gun in a rotatable turret is being evaluated. After trials, its suitability for use as a *Waffenträger* [weapons carrier] will be assessed.

The above notes prove that a high level of importance was attached to forming an effective and mobile defence against enemy tanks. By mid-1930, Germany had decided that their most likely opponent would be France. Subsequently German military planners took action to improve the performance of their anti-tank weapons to defeat all known French armour.

Many different interesting alternatives were developed from half-tracked vehicles, including heavy prime movers and several prototypes were built with some promising results. If development of these *Tankjäger* had been progressed with then the transfer to a mobile anti-tank defence would have been executed.

However, the economic situation did not allow introduction of such sophisticated equipment. Consequently in 1935, the 3.7cm TaK remained the only type of tank-defence gun in the German arsenal.

As the the commitment of the *Panzerabwehr* changed to a more active and offensive role, the designation was changed to *Panzerjäger* (tank hunter or destroyer). The *Panzerabwehr-Kanone* was also renamed to *Panzerjäger-Kanone*, but the official abbreviation PaK was retained.

Converting the 3.7cm TaK to Motorized Transport

The 3.7cm TaK was originally designed as a light anti-tank weapon to be deployed in forward defensive positions. Both size and weight were limited to allow its crew to move the gun short distances to new positions on the battlefield. For longer distances, the gun was hauled by horses.

In 1934 orders were given to modify the design of the gun to enable it to be towed by a light truck or similar vehicle. At the same time the *leichte Minenwerfer* (le Mw – light mine launcher [mortar]) 18, a gun of comparable size, was modified for the same purpose. Many 3.7cm TaK and le Mw 18 in service a number had already been converted for towing, and the remainder were brought up to the new standard. The work was undertaken at military depot workshops.

The slow conversion to motor transport had begun.

3.7cm TaK/PaK, Data

Calibre	3.7cm
Barrel length	1,665mm = L/45
Maximum range	7,000m
Muzzle velocity	745mps
Side traverse	60°
Elevation range	-8 to +25°
Rate of fire	12–15rpm
Weight in firing position	435kg
Armour penetration at 100m*	34mm
Armour penetration at 500m*	22.5mm
Armour penetration at 1,000m*	No impact

* Firing the 3.7cm PzGr, the only armour-piercing round available at that time

On 1 July 1936, the gun was officially renamed as the *Panzerabwehr-Kanone* (PaK – anti-tank gun). At the same time the le Mw 18 also received a new designation, 7.5cm *leichtes Infanterie-Geschütze* (le IG – light infantry gun) 18. To establish the required number of anti-tank defence units, orders were given for a significant increase in production of the 3.7cm PaK.

The first reliable information of the availablity of the weapon was given in the *Überblick Rüststand des Heeres* (survey of the army's equipment) list dated 1 September 1939, which shows a total of 10,411. The total of 3.7cm ammunition was some 16,000,000 rounds, the consumption during the Polish campaign amounting to approximately 2,000,000 rounds.

Towing Vehicles

How quickly the units were equipped with towing vehicles is unknown, but the critical economic situation in Germany did not allow for a speedy supply of suitable types. Indeed many of the first types selected as a towing vehicle for the new gun were the *leichte Personenkraftwagen* (light passenger car). Most were 4x2-drive open-topped civilian passenger cars from a number of different manufacturers, moderately converted to suit military purposes. But due a lack of performance and poor reliability they were seen only as a temporary solution.

The parlous state of German industry did not allow for a quick transfer to the supply of a standardized type of vehicle. For this reason a great variety of towing vehicles had to be used.

In 1938, the German motor industry was producing more than 100 different types of truck. In an effort to standardize, reduce costs and improve the poor spare parts situation, the so-called Schell Plan was initiated. After much effort, the number of truck types was reduced to 19, and that of passenger cars to 30. The Schell plan came into force in January 1940, but it took more than a year to realize.

Before outbreak of the war the following vehicles were normally used for towing the 3.7cm PaK.

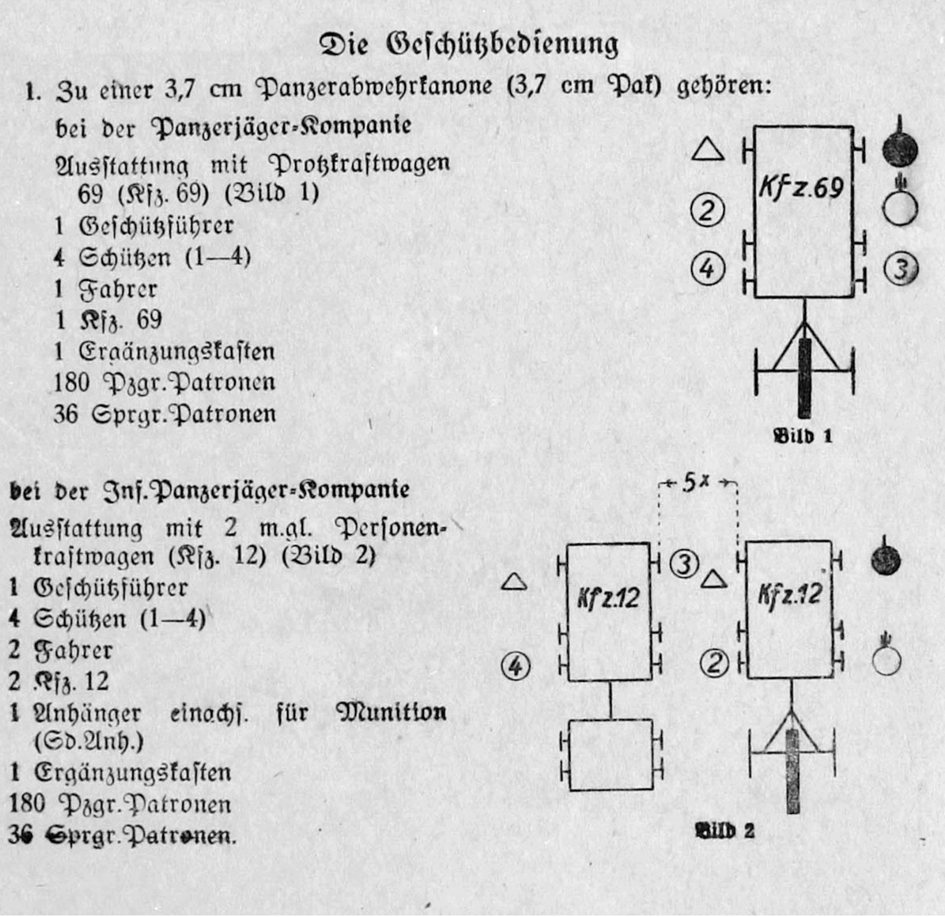
Light passenger car (Adler, etc.)
Heavy passenger car (Kfz 12)
Krupp Protzkraftwagen (Kfz 69)
1.5-ton *leichte Lastkraftwagen* (le Lkw – light truck)... Borgward, Opel, etc.
1-ton *leichte ZugKraftwagen*, (le ZgKw – light half-track vehicle)... SdKfz 10

When the invasion of Poland began, the lack of all types of suitable vehicle forced the military to commandeer civilian trucks (many remained in their civilian livery) and a larger number of light passenger cars.

A leaflet published in 1939 has an interesting detail: All PzJg companies attached to a tank division were to be equipped with the Krupp Protzkraftwagen (Kfz 69), while all InfPzJgKp attached to an infantry division were to receive the Kfz 12 medium cross-country car. It is doubtful that the above goal was entirely realized.

The ammunition stock for each gun amounted to 128 rounds of PzGrPatr armour piercing and 36 rounds of SprGrPatr high-explosive (HE). The three-axle (6x4) Krupp Protzkraftwagen could carry the six-man gun crew and all their equipment. But because the smaller two-axle (4x2) Kfz 12 had less carrying capacity and stowage, two were issued for each gun; one towed the gun and the other a *Sonderanhänger* (SdAnh – ammunition trailer) 32.)

The transition of the *Panzerjägerwaffe* from a static anti-tank defence to an actively led highly-mobile force had begun.



Die Geſchützbedienung

1. Zu einer 3,7 cm Panzerabwehrkanone (3,7 cm Pak) gehören:

bei der Panzerjäger-Kompanie

Ausſtattung mit Protzkraftwagen 69 (Kfz. 69) (Bild 1)

1 Geſchützführer
4 Schützen (1—4)
1 Fahrer
1 Kfz. 69
1 Ergänzungskaſten
180 Pzgr.Patronen
36 Sprgr.Patronen

bei der Inf.Panzerjäger-Kompanie

Ausſtattung mit 2 m.gl. Perſonenkraftwagen (Kfz. 12) (Bild 2)

1 Geſchützführer
4 Schützen (1—4)
2 Fahrer
2 Kfz. 12
1 Anhänger einachſ. für Munition (Sd.Anh.)
1 Ergänzungskaſten
180 Pzgr.Patronen
36 Sprgr.Patronen.

Infantry and tank divisions were originally issued with divergent equipment. While both were equipped the 3.7cm PaK, the PzJgAbt in a tank unit was issued with one Kfz 69 Protzkraftwagen and ammunition trailer; the PzJgAbt in an infantry unit was issued with two Kfz 12 medium cross-country cars, but one ammunition trailer. Note an error in the table shows the Kfz 12 with three axles, whereas the type had two.

Organization

Around 1934/35 first organizational structures were issued. The 3.7cm TaK were to be organized into *Panzerabwehr-Kompanien* (tank-defence companies) with each having nine guns and sufficient motor vehicles.

Initially anti-tank guns were to be issued to:

The three infantry regiments of the infantry divisions at a rate of one company (nine TaK) per regiment (total 27), to be positioned ahead of the frontline.

The divisional *Panzerabwehr-Abteilung* (tank-defence battalion) of the infantry divisions at a rate of three companies per battalion (27 TaK) to be committed to fight an advancing enemy or to protect the flanks,

The *Aufklärungs-Abteilung* (reconnaissance battalion), one *Zug* (platoon) with three 3.7cm TaK.

and

The two *Schützenbrigaden* (motorized infantry brigades) of the Panzer divisions at a rate of two platoons each with three TaK per brigade

The *Kradschützen-Abteilung* (motorcycle reconnaissance battalion), one platoon of three TaK

The *Aufklärungs-Abteilung*, one platoon of three TaK

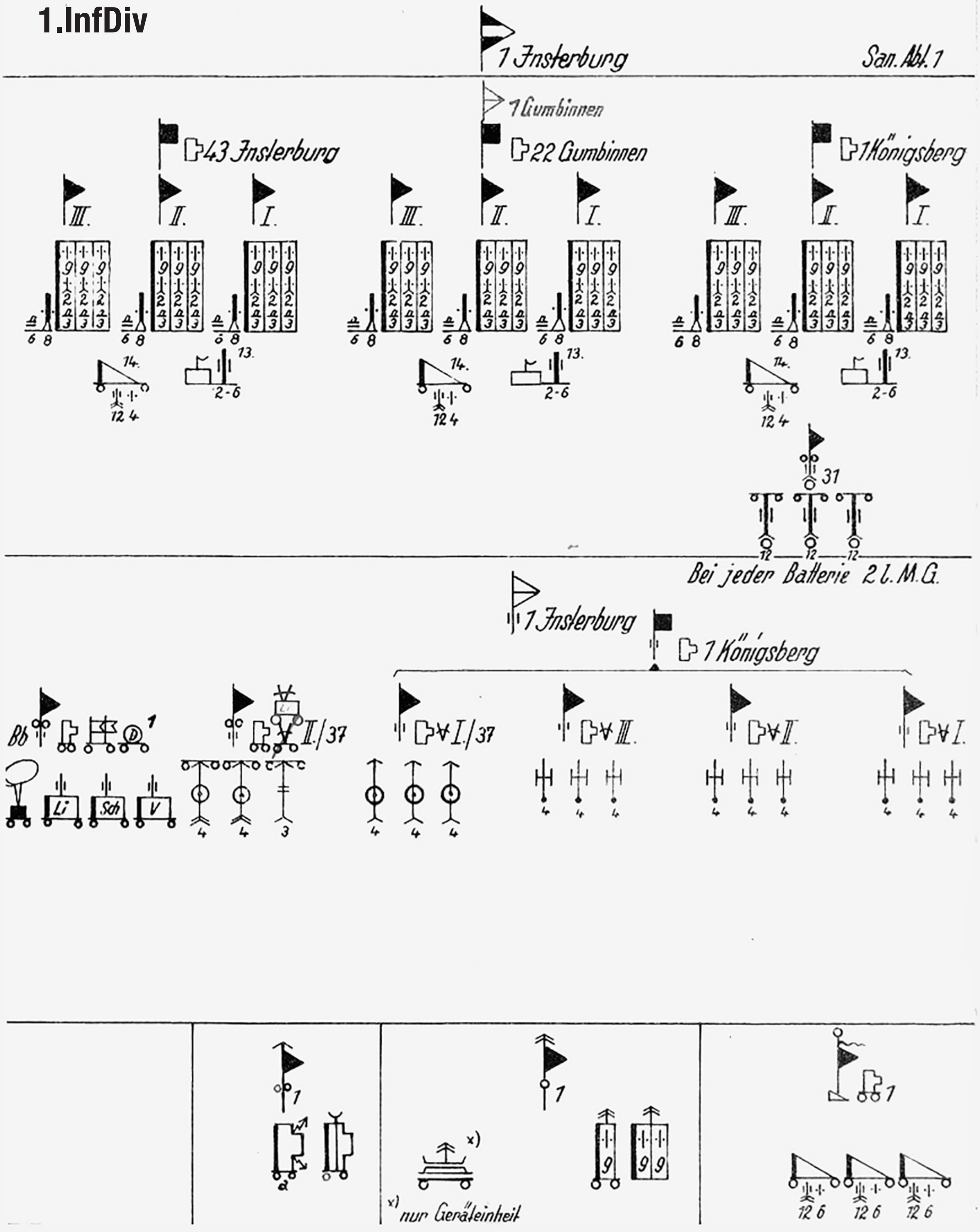
The divisional *Panzerabwehr-Abteilung* of the Panzer divisions at a rate of three companies per battalion (27 TaK)

During the first phase of mechanization, German units were supplied with civilian-type vehicles to tow guns. In the background is an Adler 3GD (Kfz 12); this open-topped car had just enough motive power to tow the gun, carry the crew and ammunition. (Getty)

Organizational Structures: September 1937

The publication of standardized organizational structures would not happen for a long time. With the establishment of the first Panzer and infantry

1.InfDiv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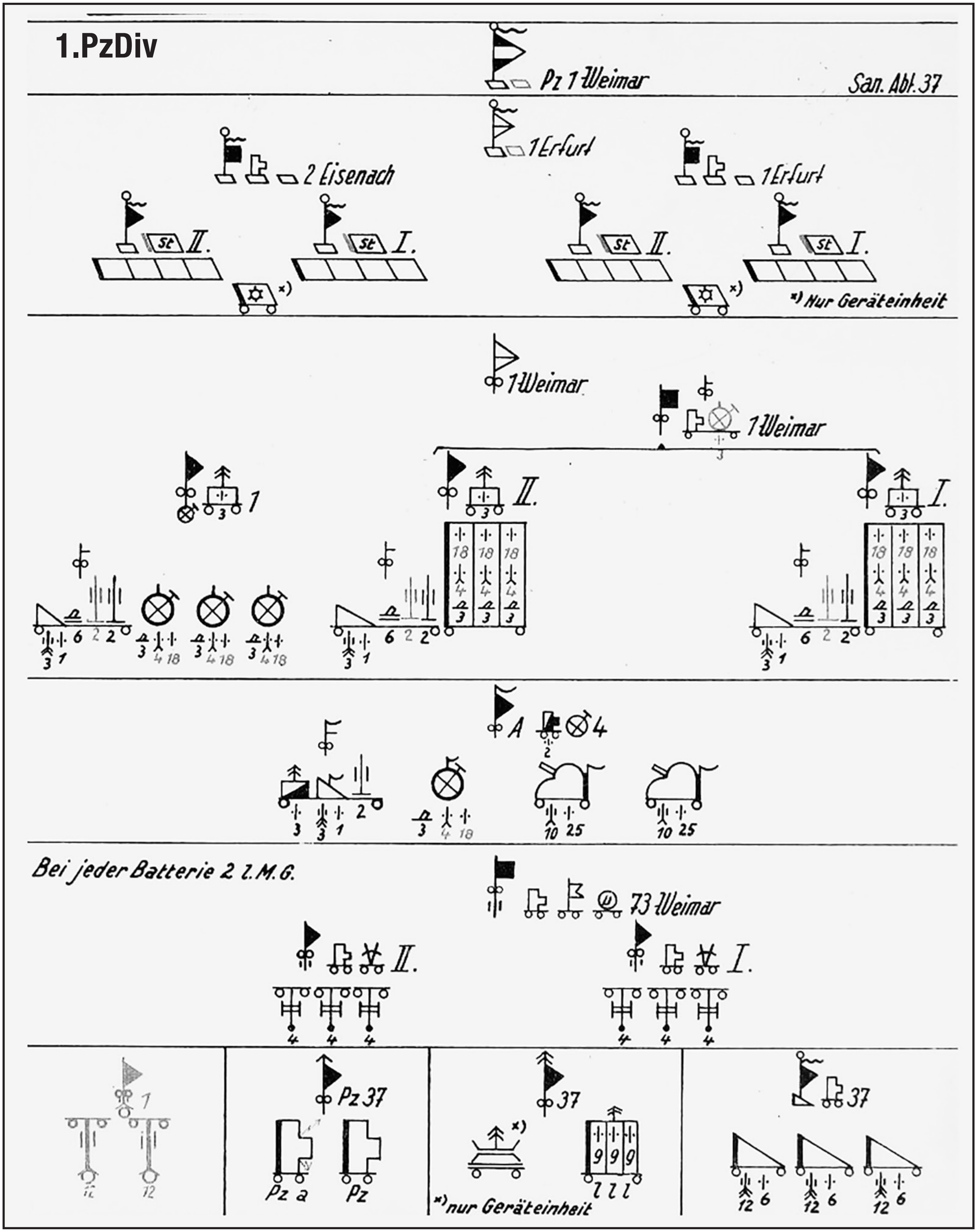
1.PzDiv
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divisions, organizational structures were collated. After a trial phase, the first *Kriegsstärkenachweisiung* (KStN – table of organization) were published (note that at that time the term *Panzerabwehr* had already (but not completely) been replaced by *Panzerjäger*). The list is by no means exhaustive:

KStN 1106 Stab PzJgAbt (mot [motorized]): 1 October 1937
This was the staff battery of a tank destroyer (TD) battalion
KStN 1122 (Teileinheit) PzJgZg 3 Geschütze (mot Zug): 1 October 1937
The anti-tank platoon (three guns, motorized) was the smallest subunit
KStN 1143 PzJgKp 9 *Geschütze* (mot Zug): 1 October 1937)
KStN 1141 PzJgKp (a), 12 *Geschütze* (mot Zug): 1 October 1937
in 1937, the TD company could have nine or 12 anti-tank guns
KStN 184 InfPzJgKp 9 *Geschütze* (mot Zug): 1 October 1937
This structure was given for TD companies of the infantry divisions
KStN 187 GebPzJgKp 9 *Geschütze* (mot Zug): 1 October1937
This structure was given for TD companies of the mountain divisions
KStN 1192 NachrZ einer PzJgAbt (mot): October 1937
This structure was given for the signal platoon of the PzJgAbt.

Changes were regularly made to all KStNs published. When a new structure was issued, orders were given to destroy the previous table. Although the numbers of the 1937-style structures are known, the respective documents have not been found. However for the 1940-style infantry and tank divisions, only a small number of valid tables are available.

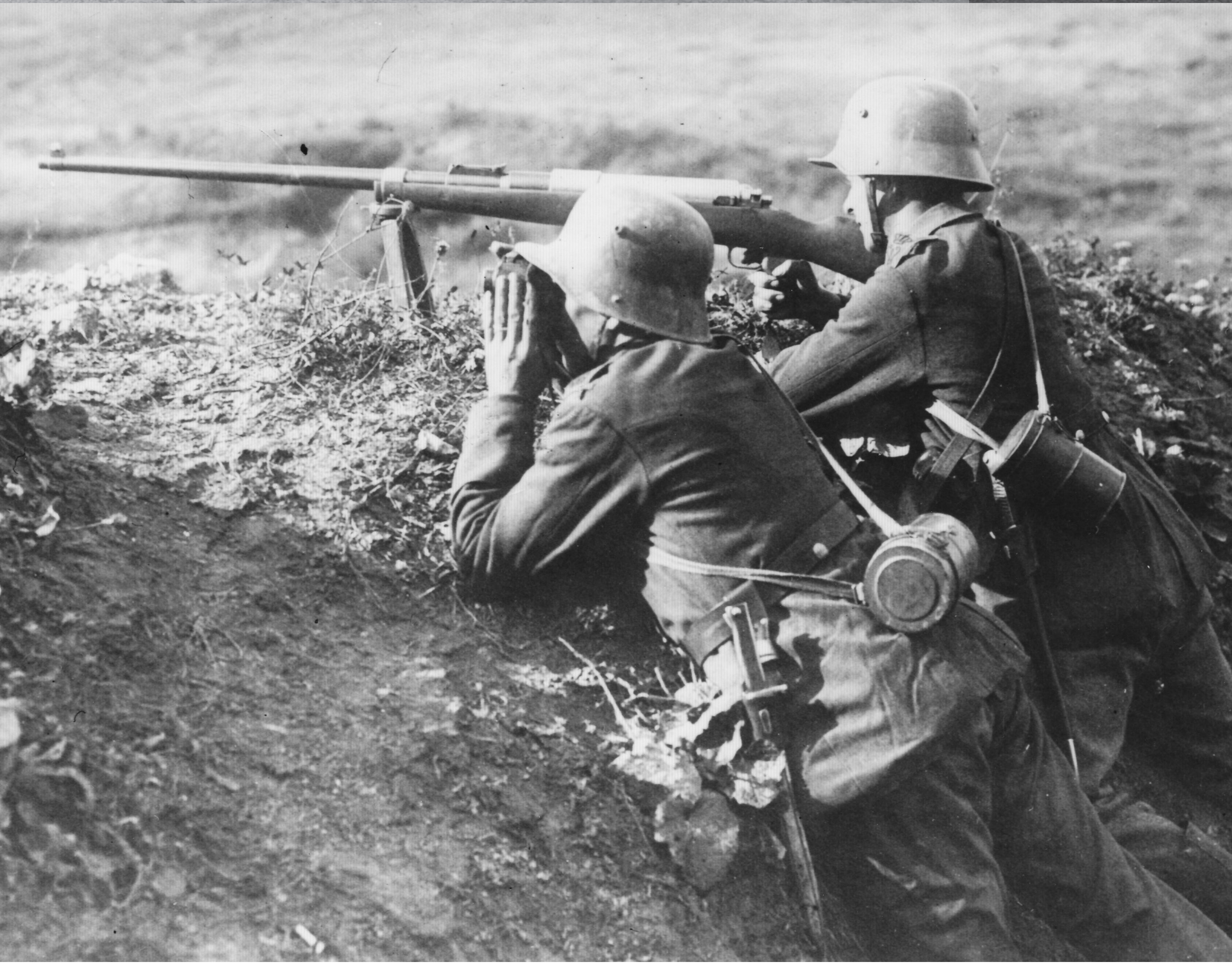
Although an increase in the number guns within the PzJgKp from nine to 12 was ordered as early as 1936; the KStN 1144 dated February 1940 shows that smaller unit structures were still being authorized.

Anti-tank Rifles

When the first tank entered battle in World War I, the development of a heavy-calibre anti-tank rifle was an obvious and cost effective solution, and in 1917 the German army had introduced the T-Gewehr into service, which would remain with front-line units until the mid-1930s.

The destructive power of an infantry weapon such as the German T-Gewehr (the first genuine anti-tank weapon) came from its firing a heavy 13mm projectile. This required a powerful propellant, which resulted in the gunner being subjected to a heavy recoil.

German manual D 87 published in 1932 noted:



An anti-tank rifle team on the battlefield: the gunner has his T-Gewehr weapon ready to fire, while the other searches for targets.

> Armoured motor vehicles cannot in general be damaged by S [pointed bullet] or s S [heavy pointed bullet] ammunition. SmK ammunition [pointed bullet with hard metal core] can penetrate the armour of a light tank and that of an armoured car, if they hit in the vertical plane. By firing at the vision equipment or machine-gun ports, it is possible that the crew could be wounded by metal fragments.

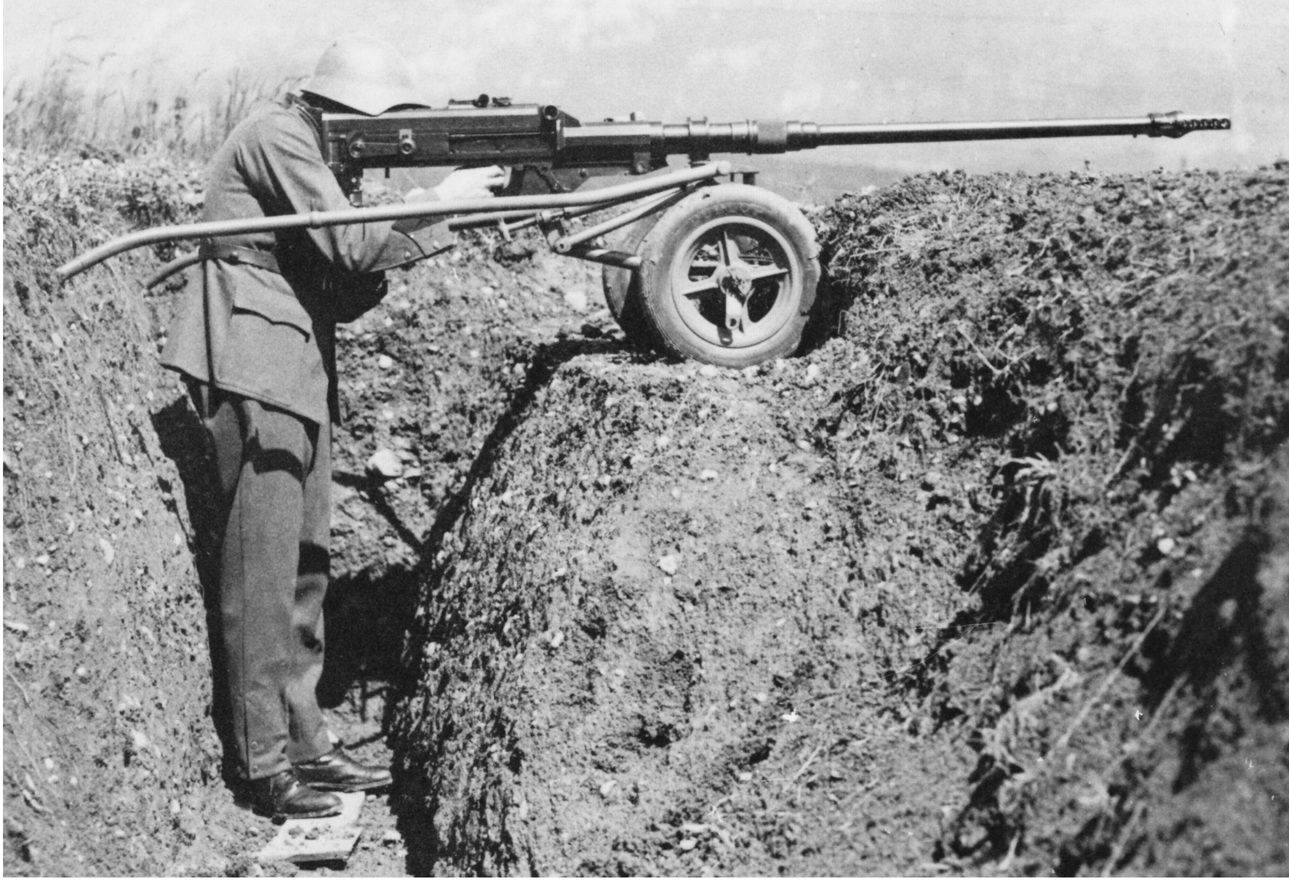
Despite these shortcomings, many nations continued to develop more advanced anti-tank rifles during in the inter-war years. Portable weapons such as the anti-tank rifle were seen to provide the front-line troops, hidden in trenches, the ability to halt the first phase of a tank attack. Small and easily carried by one or two men, the gun could be quickly moved to wherever defensive fire was required.

However, a heavier calibre anti-tank gun had a number of advantages. First of all, better ballistic performance would allow combat against a heavily armoured tank and also at longer range. The fact that the gun could also fire HE rounds allowed a wider range of targets to be attacked, including enemy gun positions and machine-gun nests.

Poland was among the first nations outside of Germany to introduce an anti-tank rifle based on the T-Gewehr. By 1935, development of their *Karabin przeciwpancerny wzór* 35 (Kb, ppanc wz.35 – anti-tank rifle model 35) had been completed. The weapon had a calibre of 7.92mm, and could penetrate 15mm-thick steel at a range of 300m.

At around the same time, the British developed the Boys .55in anti-tank rifle. This weapon had a much heavier calibre of 13.9mm designed to

Canadian soldiers being trained on the operation of the 0.55in Boys anti-tank rifle, which had a heavier calibre than that of the Panzerbüchse (PzB) 38 and 39. The gun was fitted with a five-round magazine. (Getty)



During the 1930s two Swiss companies, Oerlikon and Solothurn, developed various types of heavy machine gun. The 2cm Solothurn SS1000 featured a multi-purpose field mounting to allow fire under various conditions.

penetrate 20mm of steel plate at 100m. In 1941, the Soviet Union introduced the 14.5mm PTRD and PTRS anti-tank rifles into front-line service.

The Swiss armaments industry also produced anti-tank weapons in the inter-war period. The manufacturer Oerlikon concentrated on 20mm weapons, and by 1935 had developed a heavy all-purpose infantry weapon, able to fight armoured vehicles to a certain degree.

Solothurn, another Swiss company, also manufactured a 20mm weapon, the S-18-100, which would be issued in limited numbers to the Swiss army. This weapon was a true all-purpose infantry weapon, and a limited number were delivered to Germany.

Regarding their design, these developments were rather different. These variances resulted from a set of different technical parameters set by the maximum range of the weapon and armour penetration which was affected by the size of round fired.

The anti-tank rifle was a short-range weapon, although the true range was close to that of a standard infantry rifle and the effectiveness against an

The Red Army was issued with large numbers of anti-tank rifles. The 14.5mm PTRD (shown) and the PTRS-41 were sufficiently powerful to penetrate armour up to 40mm thick. This was the weapon that forced the introduction of *Panzerschürzen* (side skirts) for Panzers and also the StuG III and IV.

armoured target was limited. The table below shows the performance of the most commonly used weapons in foreign armies in World War II.

The anti-tank rifle would be used in the initial phases of the war, but as armour protection was improved more modern weapons were developed and produced.

A notable exception was the Russian-manufactured 14.5mm PTRD and PTRS which entered service in 1941. At short range the gun proved to be able to defeat all German light tanks and to penetrate the side armour of most German tanks. Dedicated anti-tank battalions armed with this weapon were formed and remained in service throughout the war. The gun was feared by German tank crews who demanded extra protection; this resulted in the fitting of *Panzerschürzen* (side skirts).

Technical data	Karabin przeciwpancerny wzór 35, Poland	Rifle, Anti-Tank, . .55in, Boys, UK	Solothurn S-18/1000 Switzerland	PTRD Soviet Union
Calibre	7.92mm	13.9mm	20mm	14.5mm
Weight	9.5kg	16.3kg	54kg	16.3kg
Penetration	15mm at 100m	*12mm at 100m	27mm at 500m	40mm at 300m

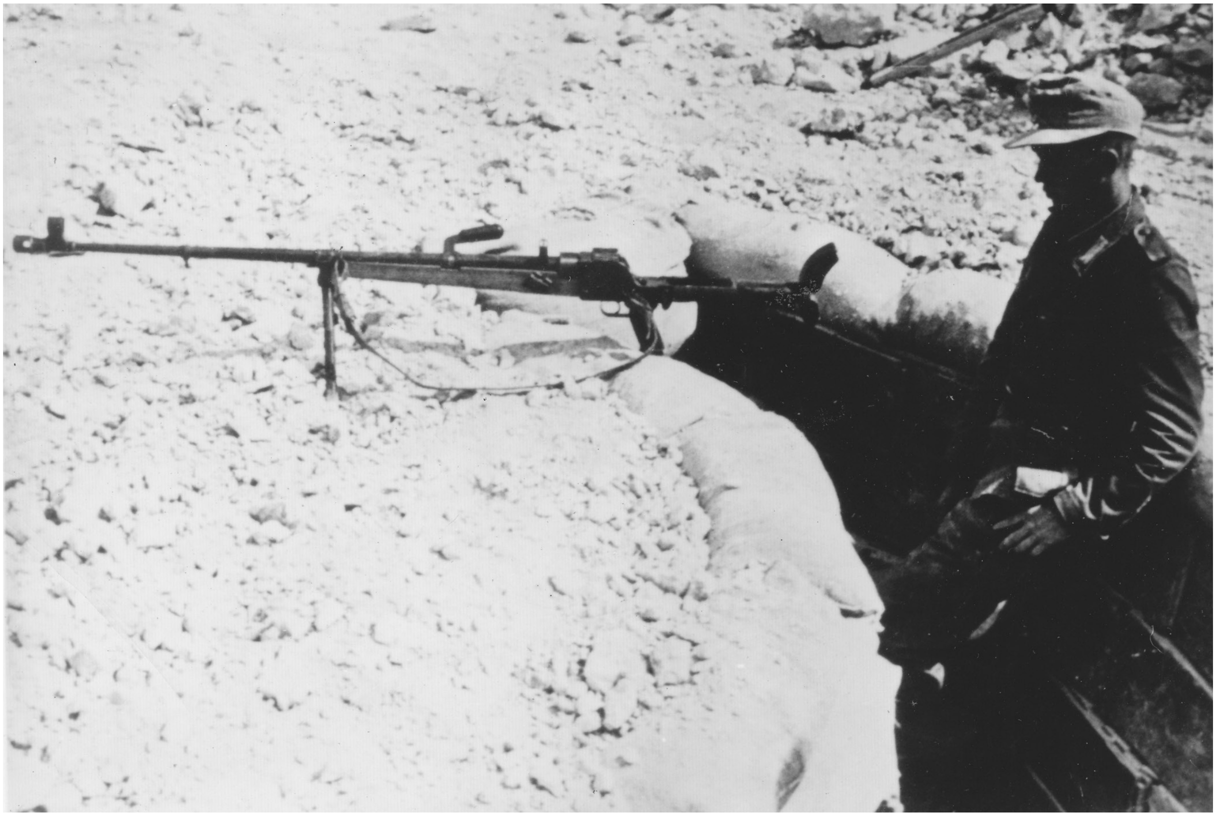
* According to a test of enemy weapons captured in Norway, April 1940; possibly the result of inadequate handling.

Panzerbüchse 38/39

In Germany, the development of an anti-tank rifle was initially banned by the restrictions of the Treaty of Versailles. However in 1935, development of a portable anti-tank weapon was initiated. The *Waffenamt* specified a calibre of 7.92mm, disregarding opinions noted in an official document dated 1932: an incomprehensible decision. Why chose such a light calibre, with the knowledge that current French tanks had 40mm thick cast armour.

Technical data	PzB 38	PzB 39	98k rifle
Calibre	7.92mm	7.92mm	7.92mm
Weight	16.2kg	12.6kg	4.2kg
Barrel length	1,085mm	1,085mm	600mm
Muzzle velocity	1,140mps	1,150mps	755mps
Firing rate	10rpm	12 -14rpm	n/a
Maximum range	300m	300m	n/a
Penetration	30mm at 100m	30mm at 100m	8.5mm at 400m

Both the PzB 38 (shown) and 39 had a relatively small caliber (7.92mm), but fired special ammunition able to penetrate 30mm of armour at a range of 100m. The gun entered service in 1940, but was soon obsolete as heavier enemy tanks entered the battlefront.



In 1935, Poland introduced *Karabin przeciwpancerny UR wzór* 35, a high-velocity 7.92mm anti-tank rifle which could penetrate 15mm of armour at 300m range. However, the weapon was obsolete by the time of the invasion, although large numbers were captured and used by the German army.

The new weapon, the Panzerbüchse (PzB – hunting rifle) 38, relied on the 7.92mm Patrone 318, special ammunition. The cartridge case was filled with a much more powerful propellant when compared to the standard ammunition for the 98k carbine. Apparently it was hoped that this simple expedient would considerably increase armour penetration.

The PzB 38 weighed over 16.2kg, almost identical to the later and much more powerful Russian PTRD anti-tank rifle. It was introduced into service at a very slow pace. According to the *Überblick Rüststand des Heeres* dated September 1939 some 62 of the type were available. It also noted that production in the coming months was planned for an average of 150 per month.

The weapon was quickly superseded, beginning in May 1940, by the PzB 39 which had identical performance, but weighed less at 12.6kg.

Limited numbers of the 7.92mm wz.35 anti-tank rifle taken from the Polish army were pressed into service as a *Beutewaffe* (captured weapon). It was noted in the *Überblick Rüststand des Heeres* dated April 1940 under the designation PzB 846(p).

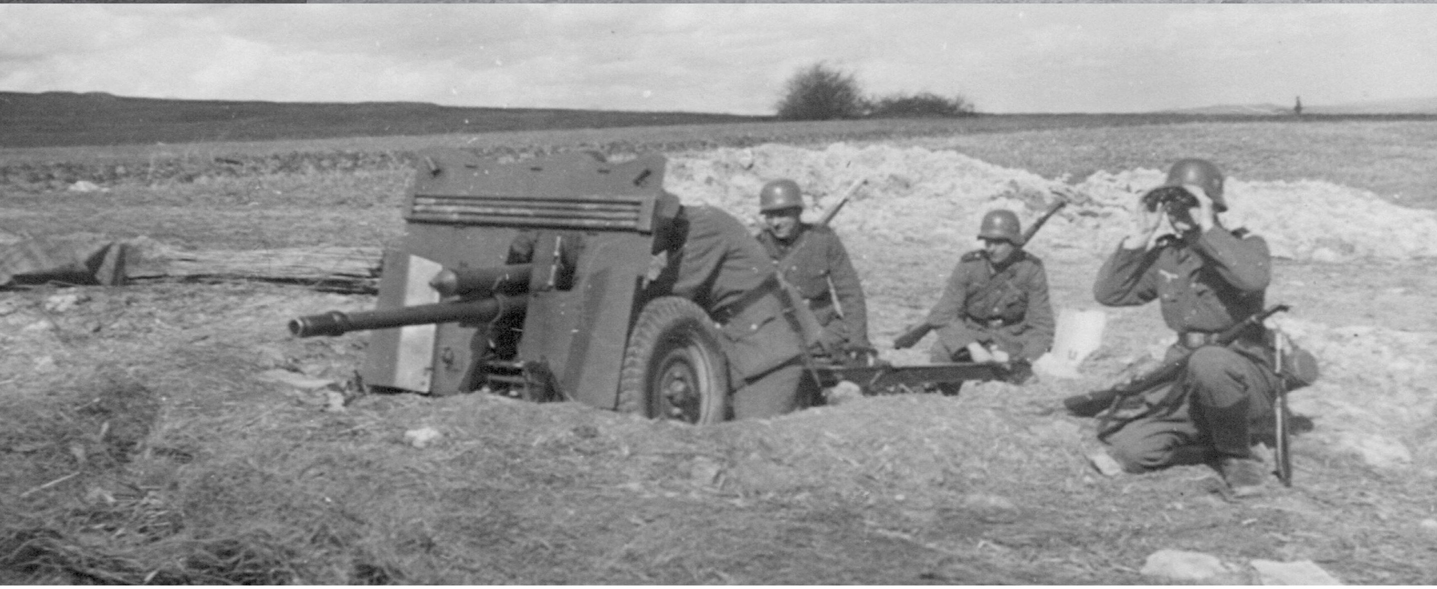
Foreign Anti-tank Weapons

During the years leading up to the outbreak of World War II, independent states Austria and Czechoslovakia were annexed by Germany, without generating any reaction from Great Britain or France. Importantly, the military arsenals of both nations became available to the German military.

The performance of available anti-tank weapons was comparable to that of the German 3.7cm PaK. However, to introduce any of the captured guns raised certain problems. German troops had to be specially trained, and the supply of ammunition and spare parts had to be ensured. It should also be noted that although German forces had gained more artillery it would exacerbate the lack of towing vehicles. For this reason many guns of foreign origin pressed into German service were at first used in static positions.

4.7cm PaK(ö)

With the Anschluss of Austria, a great number of weapons became available. One of the more interesting types was the 4.7cm Böhler *Panzerabwehrkanone*.



The 3.7cm PaK(t) had been developed for the Czechoslovak army, and after the occupation large numbers were commandeered and used by the German army. The gun had a performance comparable to the German-built 3.7cm PaK.

This weapon had been designed as a dual-purpose infantry gun for the Austrian army, which was also sold under license to a number of nations, including Latvia and Italy.

The gun was accepted by the German *Waffenamt* under the designation 4.7cm *Infanteriekanone* (Ik – infantry gun) M 35/36, or 4.7cm PaK(ö), (ö – *Osterreichische* – Austrian) and it was intended to position them in border fortifications. In December 1938 *Heeresgruppe* 2 noted in a report:

> Installation of the 4.7cm Böhler gun as PaK in our fortifications in the west.
>
> 1) The Führer has decided to install the 4.7cm Böhler infantry guns captured from Austrian stocks as tank-defence weapons in our Westwall fortifications. The number of guns available from the beginning of next year will be:
> 2) 330 guns with an estimated 144,000 rounds.

This number is confirmed in the *Überblick Rüststand des Heeres* dated September 1939. Very little is known as to further usage after the capture of France.

3.7cm PaK 37(t)

The Czechoslovak army had taken delivery of large numbers of Škoda-manufactured 3.7cm anti-tank guns. The conventional weapon had a performance comparable to anti-tank guns of other nations.

By 1938/39, the *Waffenamt* reported that 883 of the 3.7cm PaK(t), (t – *Tschechisch* – Czechoslovak) were available, and were issued monthly to *Panzerjäger* companies of infantry divisions. An unknown number were mounted in fortifications.

4.7cm PaK(t)

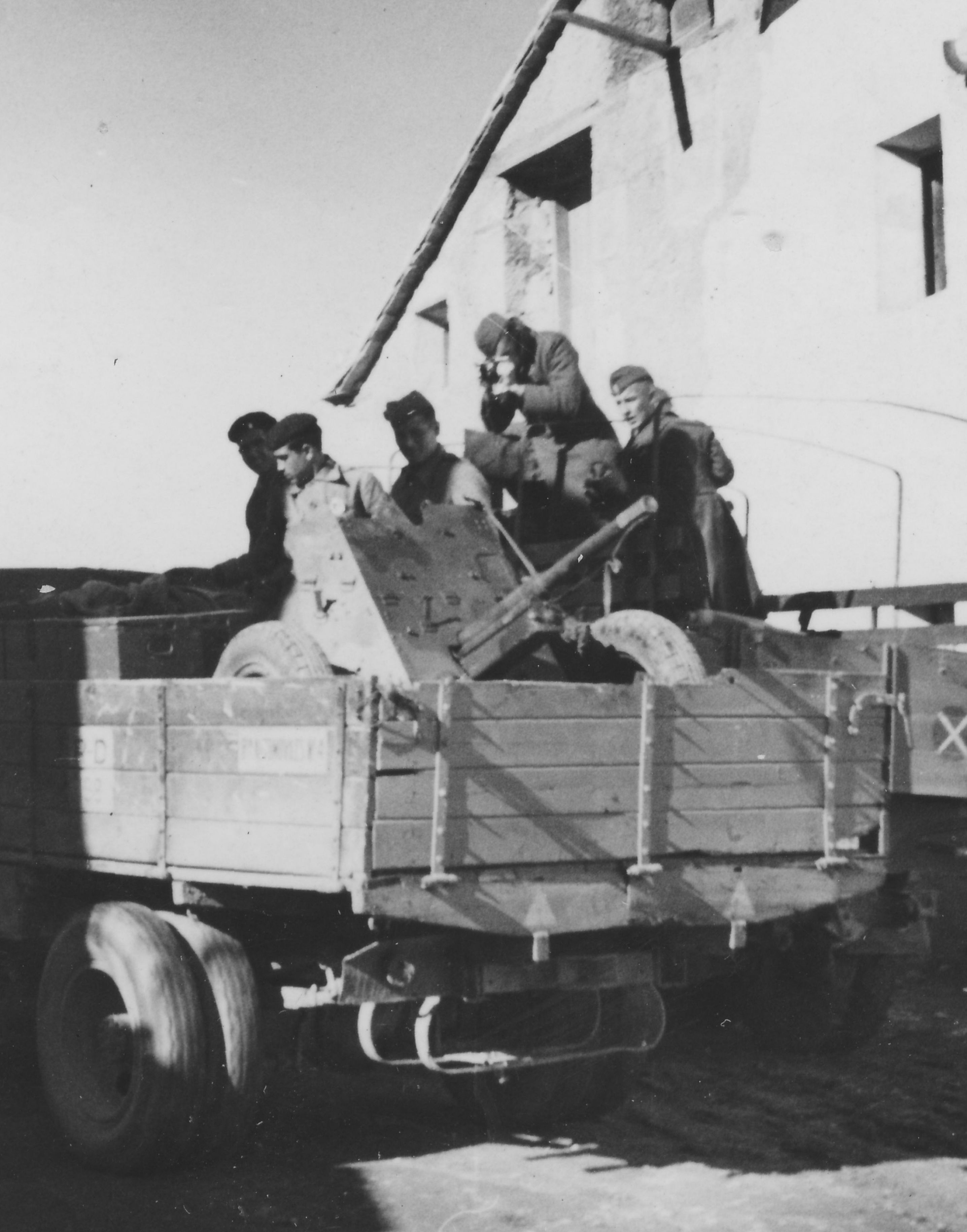
A further Czechoslovak anti-tank gun, the 4.7cm vz 38 was developed in 1937 and initially, limited numbers were produced for export only. After the occupation, the Germans quickly decided to adopt this powerful gun, and all export orders were halted. The gun would only be used on a self-propelled carriage; the *Panzerjäger* I.

German anti-tank guns introduced before 1939	MG 34	PzB 38/39**	3.7cm PaK	3.7cm(t)	4.7cm(t)	4.7cm PaK (ö) Böhler
Weight in position	12.3kg	16.2kg/12.6kg	435kg	370kg	Used only as SP gun	355kg
Penetration at 100m	20mm	30mm	35mm	36mm	n/a	n/a
Penetration at 500m	0	25mm at 300m	326mm	33mm	50mm	44mm
Penetration at 1,000m	0	0	21mm	0	n/a	n/a

* Using only data taken from German documents, not all data available.

** Firing SmK ammunition.

The Czech-built 4.7cm PaK was classified by the German army as a medium PaK, and had a performance comparable to that of the German-built 5cm PaK 38. Most of those commandeered were used to produce the *Panzerjäger* I.



Spanish Civil War

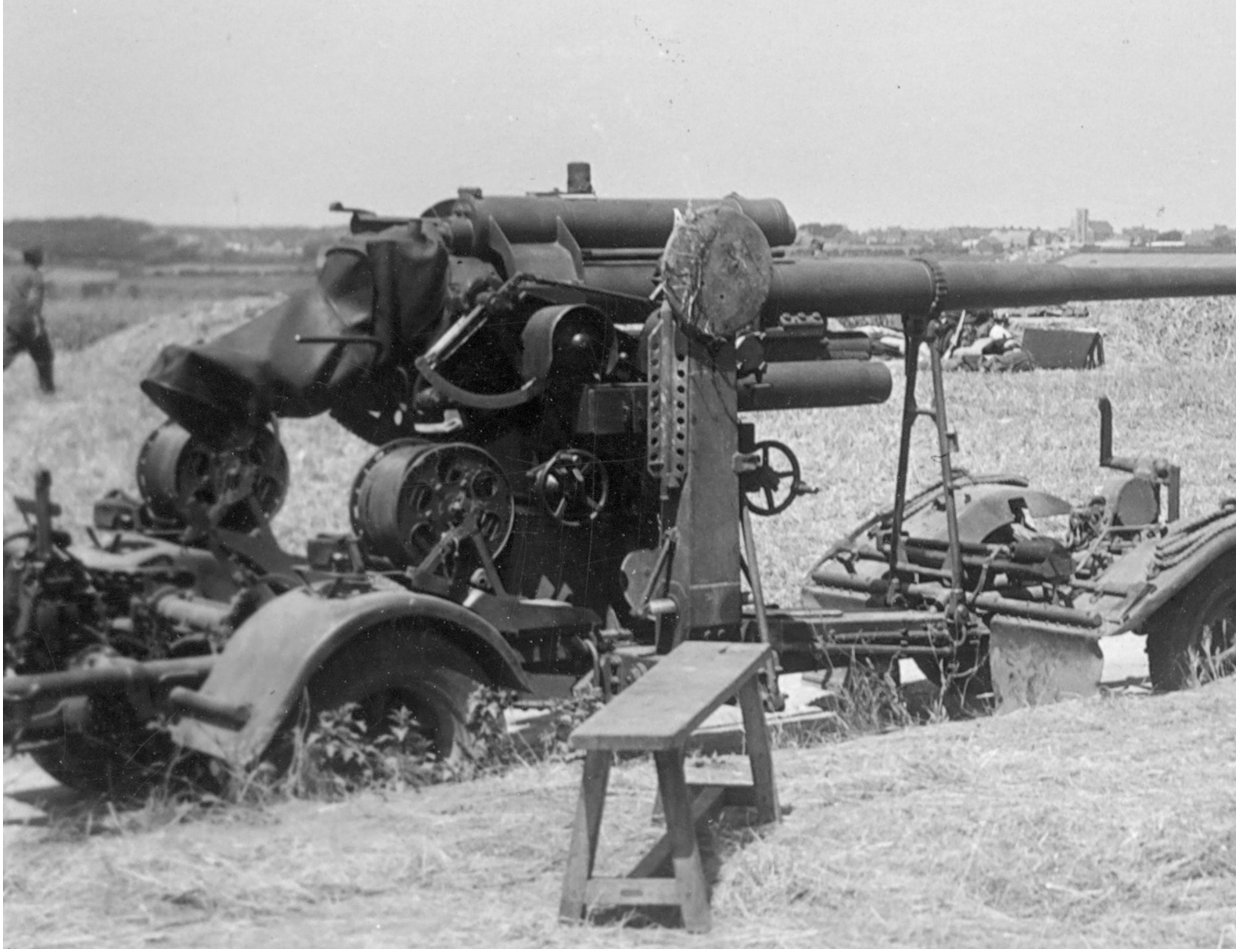
2

On 1 December 1936, a force of some 5,000 German troops landed at the port of Cadiz following a call for help from General Franco: Adolf Hitler had decided to assist the Nationalists in the Spanish civil war (July 1936 – March 1939). Beside any ideological reason, he thought that the conflict could also serve as a welcome opportunity to test German weaponry and tactics under war conditions. Furthermore the military support should encourage a future Spanish (Nationalist) government not to be hostile to Germany in the future, an important aspect being a reliable supply of essential raw materials. Firstly a number of military advisers were sent to Spain, followed by the first detachment of troops and their equipment. In 1937, ground operations by the Legion Condor – as the detachment became officially known – were supported by PzKpfw I tanks and anti-tank guns.

In January 1939, the OKH published a report, explaining the scope of the support:

> I. Organizational experience.
> 1.) Scope of participation by the army.
> Main focus of German support for the Spanish Nationalist forces is supplied by Legion Condor troops. The army dispatched the following groups:
>
> – A *Nachrichtengruppe* [signals group].
> – A *Gruppe Horch* [sound detector group].
> – A *Gruppe* Panzer and PaK [tanks and anti-tank guns], to advise Spanish armoured and tank destroyer forces being equipped with German and captured foreign weapons. To avoid improper handling and losses, the spare part stores for tanks and anti-tank guns will be managed by Germans only.

The 3.7cm PaK was among the many weapons Germany delivered to the Spanish Nationalists during the civil war. At that time the gun was sufficiently powerful to defeat the light armour of the Soviet-supplied T-26 and BT tanks.



A number of 8.8cm FlaK 18 were sent as part of the air-defence group for the Condor Legion. It remains unknown whether these guns were regularly used in an anti-tank role. The gun was usually towed by an SdKfz 7 medium half-track tractor, but this has replaced by standard 3-ton military truck.

2.) Organization of the formations.

The normal structure of a division is as follows:- Three to six batteries equipped with 7.5 and 10.5cm guns. Anti-tank units were only available in front-line areas. The following *Sondertruppen* [special units] supporting Nationalists formations were available in October 1938:

One cavalry division formed from six mounted regiments.

Two Panzer battalions each with three companies (one equipped with captured equipment). The companies with German equipment had 16 tanks each.

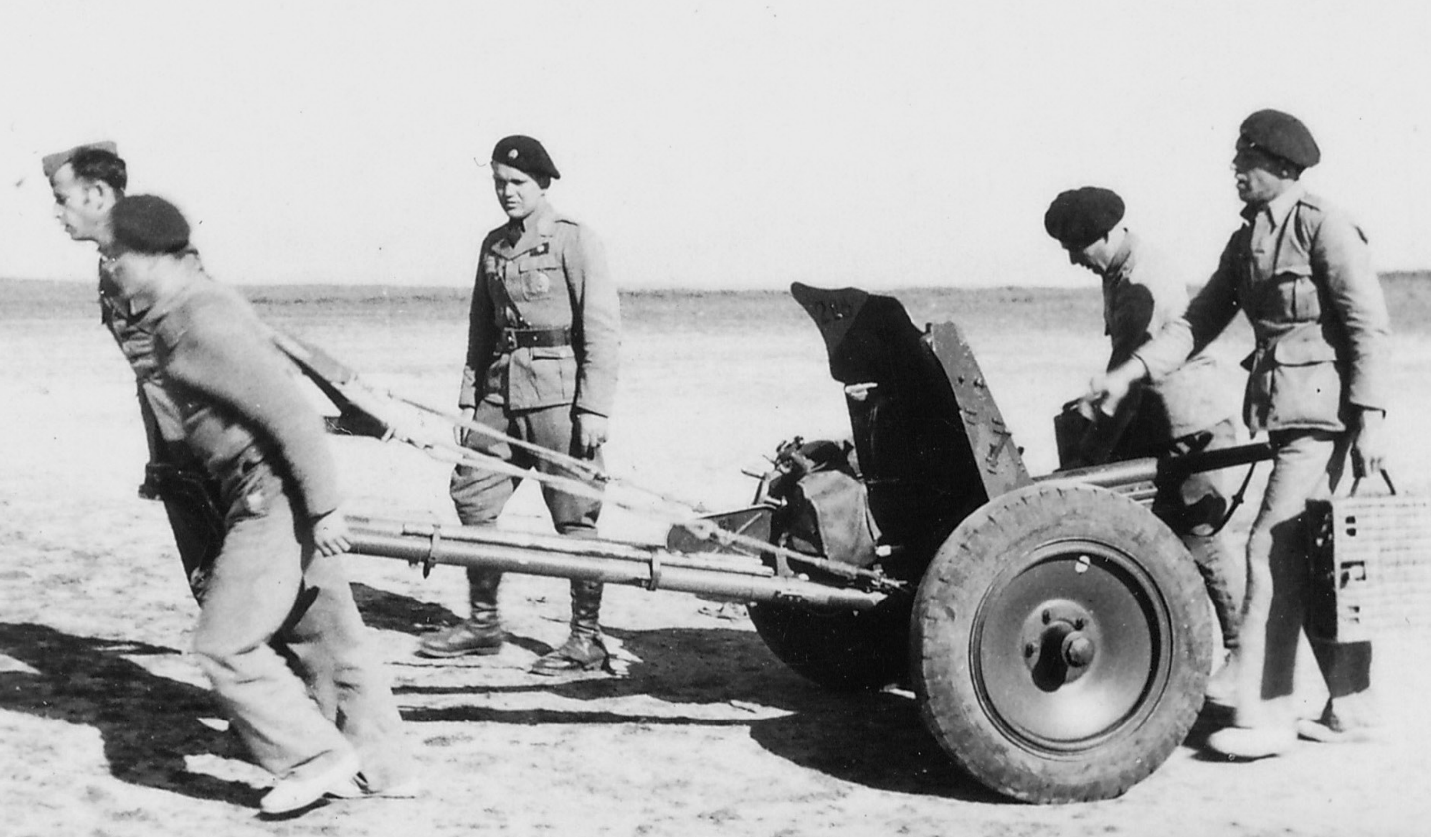
A total of 17 PaK companies, each with ten guns.

II. Tactical experiences

The tactical experiences gained during the Spanish Civil War cannot be compared to combat between modern well-organized, well-trained and well-led large armies.

8.) Anti-tank defence

Due to the small number of tanks and anti-tank guns available we could gather only limited experience, primarily in the small-scale operations by the *Panzerabwehrtruppe* [tank defence troop]. However, we did gain valuable technical experience. Anti-tank guns were deployed in combat only according to the methods and the limited scope of the 14.Kp of the infantry regiments. An [offensive and situation-related] commitment similar to the divisional PzAbwAbt took never place. According to the experiences around Madrid, the PaK has proved effective; several good results, such as defeating Soviet-built tanks [T-26, BT-5] were noted. When these tanks changed their tactic and stopped at some 1,000m range, the short-ranged PaK proved to be useless. As an expedient we demand a change in the graduation of the gunsight for ranges up to 1,500m. However, development and introduction of a more powerful PaK is considered as being necessary.



A 3.7cm PaK in service with the Nationalist forces: Two of the five-man crew wear harnesses to pull the gun to a new position on the battlefront.

The Heinkel He112 was repeatedly successfully when used to strafe combat armoured vehicles. The 2cm *Maschinengewehr* C30 firing the high-explosive armour-piercing bullet was sufficiently effective.

Anti-tank guns have often been proven to be to defeat tanks due to a higher rate of fire, their accuracy and high impact on the target. Thoroughly camouflaged an anti-tank gun is almost invisible to an attacking tank. A sufficient allotment of anti-tank guns organized in well-hidden positions will inevitably lead to high losses of enemy tanks.

Some reports suggest that one PaK can protect a front up to 200m wide. These figures seem to apply only for small-scale tank units as deployed in Spain, but certainly not in normal situation with an expected mass attack by tanks.

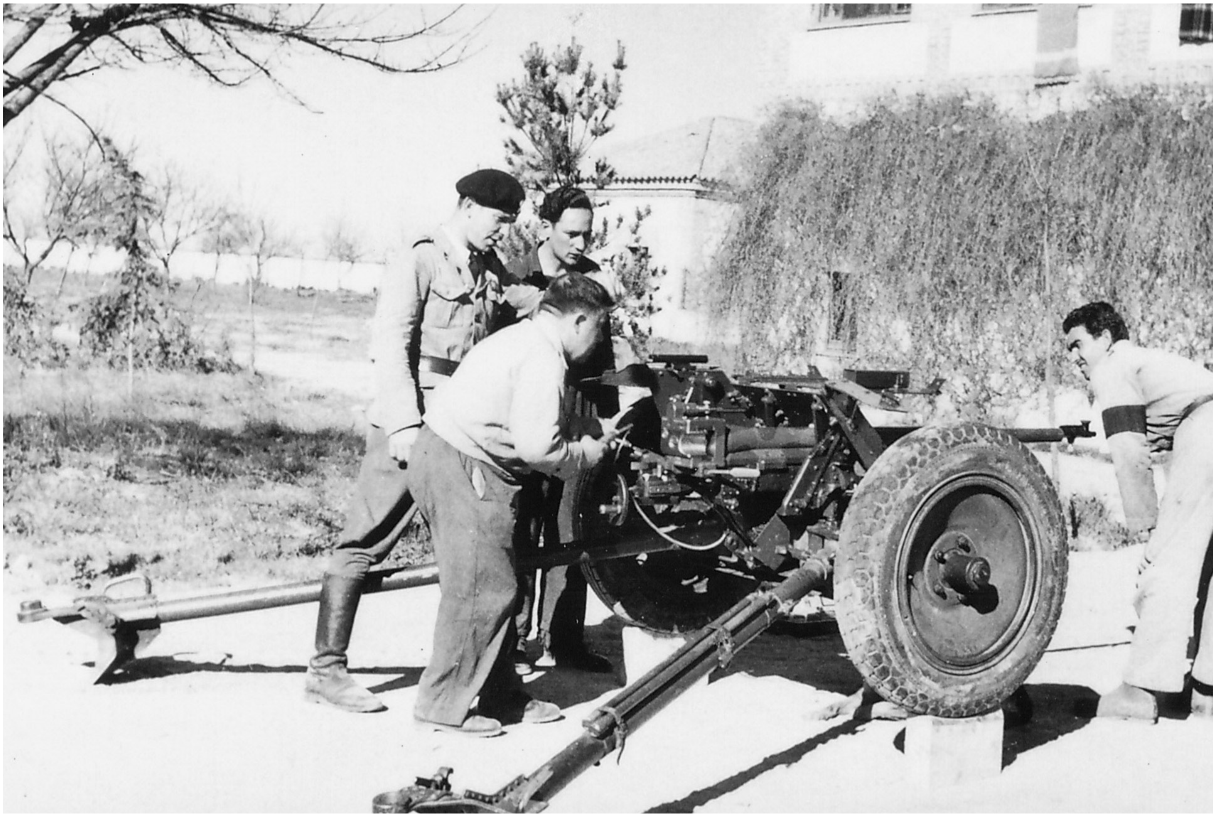
Due to a deficiency of artillery in Spain, anti-tank guns were often used as infantry assault guns during an attack and on the defence. Others were deployed to attack machine-gun positions and concrete pillboxes.

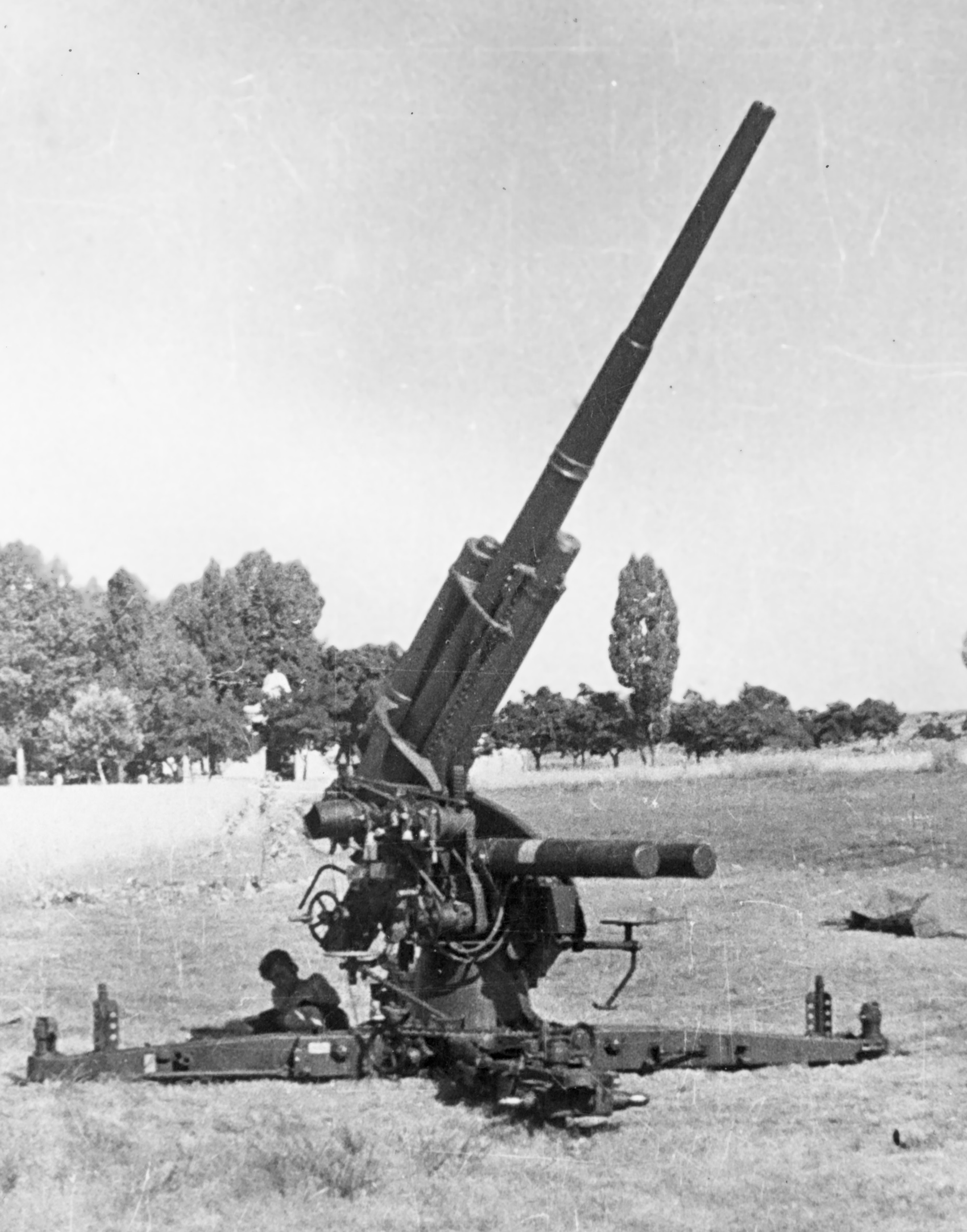
The ‘Red’ [Republican] often made use of tank obstacles such as ditches, some of which were over 500m in length, dug at extraordinary expense. These proved to be reliable barriers.

> Due to the substantial width of the fronts and an overall lack of trained pioneers, mines were not used as anti-tank obstacles.
> For close defence, a bottle filled with fuel [Molotov cocktail] could be used with some success; a tank hit by one or more usually caught fire and was destroyed.

The above report indicates that the German 'contribution' in support of the Nationalists was an estimated 100 PzKpfw I and 170 3.7cm PaK. These weapons were sent with instructors and mechanics to ensure that they were correctly deployed and were kept in operational condition.

Apparently the concept of armoured warfare tactics developed by the German military since Hitler's rise to power proved to be very effective. However, the officer's opinion as to the effectiveness of the 3.7cm PaK is not surprising as more powerful guns would allow heavier tanks to be fought and at longer range. But, the deduction that an anti-tank gun is the superior weapon for attacking an enemy tank is highly questionable, since at that time only Russian light tanks (T-26 and BT-5) were engaged and they had very thin 7 to 16mm armour. Finally, German tank tactics for an offensive were elaborated to neutralize the menace of anti-tank guns.


Two civilian engineers adjusting the sighting telescope on a 3.7cm PaK. To facilitate this, the gun shield has been folded down and the gun has been levelled by placing the wheels on wooden blocks.



Early Heavy AT Weapons

3

With the introduction of the heavily-armoured tank (initiated by the French), the development of a more powerful anti-tank gun was only a question of time. France led the search and would soon develop the 47mm *Modèle* 1937 anti-tank gun which had a much-improved performance over all previous weapons. The German intelligence service published a leaflet comparing current French and German anti-tank guns, using what appears to be information taken directly from French publications or estimated data. The German document shows the new French 47mm gun, and a 75mm gun, possibly the *Canon de* 75mm *Modèle* 1897 field gun. Details of the German 3.7cm and 7.5cm anti-tank guns are shown, as are those for the prototype of the 5cm PaK 38.

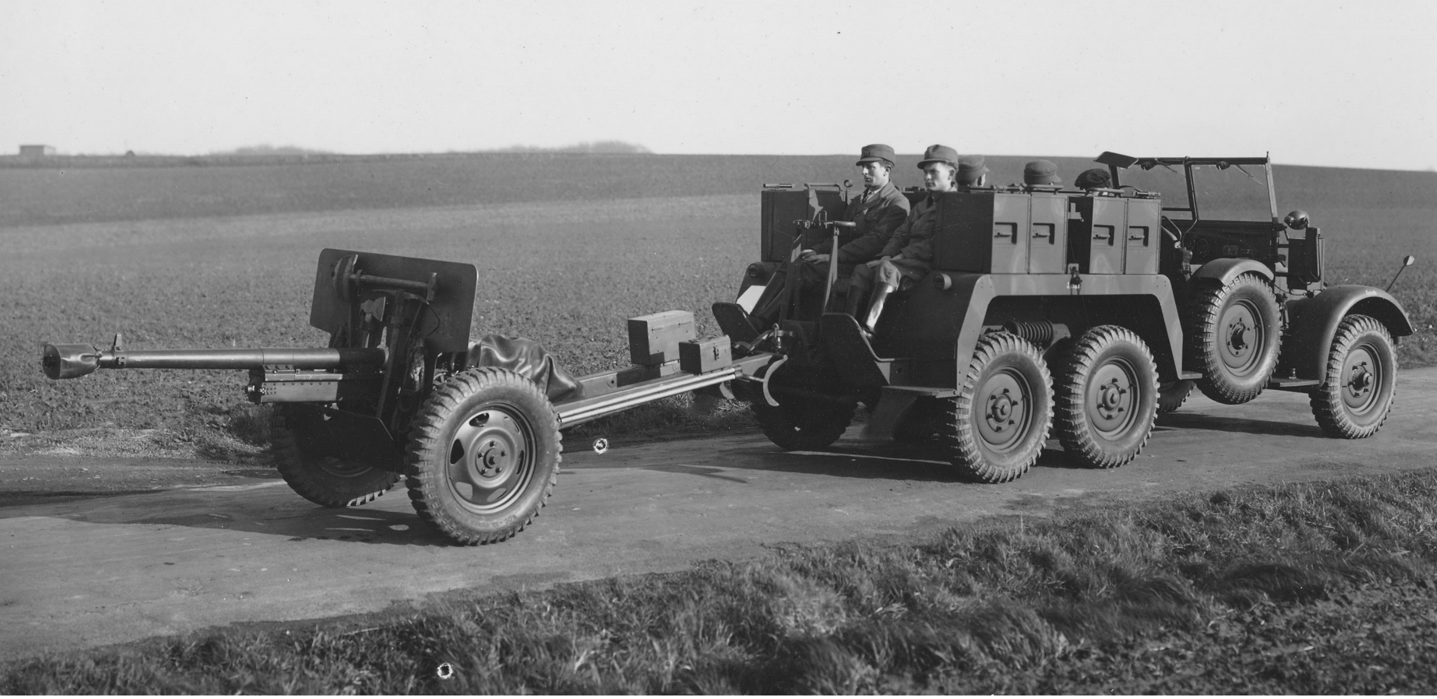
5cm PaK 38

German documents from the mid-1930s show that the introduction of a more powerful anti-tank gun was demanded quite early in the process of forming the new German army.

Trials were undertaken to improve the penetration performance of the 3.7cm TaK by increasing the length of the barrel and by using a more powerful shell propellant. The increased recoil forces were to be dispersed by a muzzle brake. However, armaments designers decided that despite an improved ballistic performance the 3.7cm shell would still have only a limited impact on a target. All work on the project was cancelled.

The introduction of heavily-armoured French tanks helped those who advocated the development of heavier calibre anti-tank weapons. New

The 8.8cm *Flugzeugabwehrkanone* (FlaK) 18 was developed as an anti-aircraft gun with an effective range of 8,000m (9,900m maximum) to attack Allied aircraft flying at high altitudes. The weapon had a flat trajectory and maximum ground range of 14,800m, which made it ideal for attacking hardened ground targets and armour.



In 1936, Krupp independently began the design of an anti-tank gun, the 4.5cm PaK L/50. Work had been completed by 1937, but the gun did not enter service with the *Wehrmacht* and so it must be assumed that the 4.5cm PaK was intended for export only. This rare photograph shows the gun being towed by a *Protzkraftwagen* on the Krupp proving grounds.

specifications were drawn up and minimum criteria set; most importantly the gun must be capable of penetrating 40mm of cast armour at a range of 700m.

In 1937, Rheinmetall-Borsig delivered the first prototype which was initially designated as the 5cm TaK and according to technical literature of the time, the gun had a calibre length of L/35. (After careful examination of contemporary photographs, this appears to be wrong as the barrel length looks to be at least L/65. This makes the armour penetration of 40mm at 700mm range entirely plausible.) The gun was fitted with an interesting feature: to have a stable firing platform, a small pedestal located between the wheels could be folded down, cutting-off the spring recoil system. However, for an unknown reason, it was not adopted for production weapons; possibly the armour penetration requirements were increased.

In 1938, Rheinmetall introduced an advanced model, which, although very similar to the previous gun, now had a barrel fitted with a muzzle brake. The pedestal was not fitted.

At the time of its introduction, the gun fired two different types of ammunition:

5cm SprGrPatr, high-explosive round

5cm PzGrPatr 39, standard armour-piercing round

Series production was ordered in late 1939. But severe problems at the manufacturer would delay deliveries for months.

By the mid-1930s, two new types of anti-tank gun were developed to production readiness.

5cm PaK, Data

Calibre	5cm
Barrel length	3,000mm = L/60
Maximum range	9,400m
Muzzle velocity	834mps*
Side traverse	65°
Elevation range	-8 to +27°
Rate of fire	12-14rpm
Weight in firing position	986kg
Armour penetration at 100m*	69mm
Armour penetration at 500m*	59mm
Armour penetration at 1,000m*	48mm

* PzGr 39, until 1941 no tungsten core round was available

4.7cm PaK Rheinmetall

In parallel to the continuing work on the 5cm TaK/PaK 38, Rheinmetall completed the design of a gun which had an unusual (for German standards) 4.7cm calibre. The gun was not destined for the German army, but was to be produced for export only. Interestingly, the gun was surprisingly lightweight, around half that of the PaK 38. The only known customer was the Dutch army, which introduced the gun into service in 1940. After the invasion of the Low Countries in 1940, all surviving guns were pressed into service by the Germans as the 4.7cm PaK 188(h). Although exact details are not known, it is certain that most were issued to infantry divisions as were the Škoda-built 3.7cm PaK(t).

4.7cm PaK 188(h), Data

Calibre	4.7cm
Barrel length	n/a
Maximum range	3,000m
Muzzle velocity	628mps
Side traverse	n/a
Elevation range	n/a
Rate of fire	n/a
Weight in firing position	507kg
Armour penetration at 100m*	n/a
Armour penetration at 500m*	n/a
Armour penetration at 1,000m*	n/a

* PzGr 39, until 1941 no tungsten core round was available

4.5cm PaK Krupp

Working in parallel to Rheinmetall, armaments manufacturer Krupp also developed an anti-tank gun, but with a somewhat peculiar calibre of 4.5cm, and also differing in detail from German standards, it was possibly produced for export only. Sadly, little else is known of this interesting weapon.

4.5cm PaK (Krupp), Data

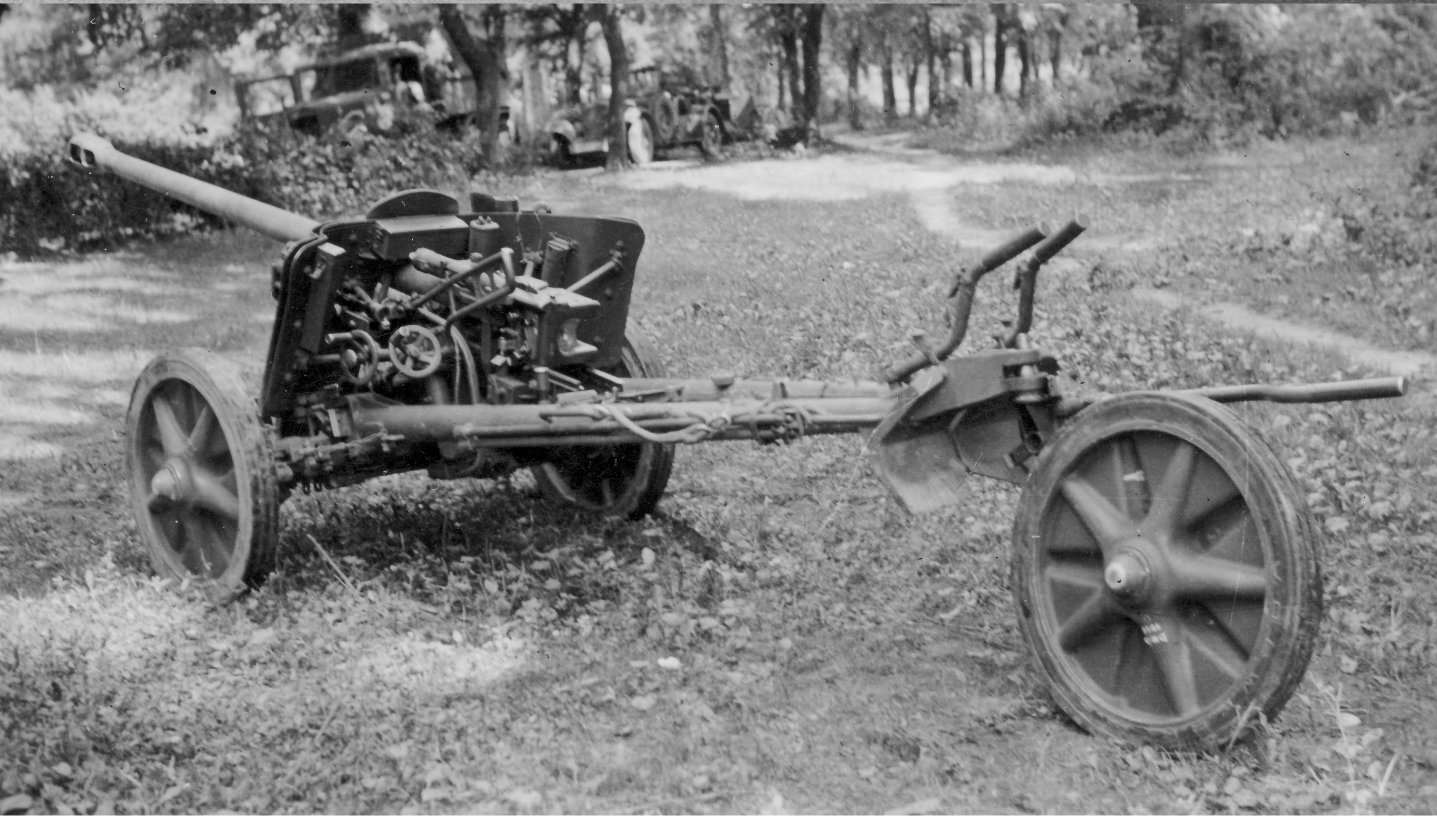
Calibre	4.5cm
Barrel length	2,250mm = L/50
Maximum range	7,000m
Muzzle velocity	750mps
Side traverse	60°
Elevation range	-10 to +20°
Rate of fire	25rpm
Weight in firing position	500kg
Armour penetration at 100m*	n/a
Armour penetration at 500m*	n/a
Armour penetration at 1,000m*	n/a

In a letter dated 11 April 1938, *Generaloberst* Ludwig Beck, chief of the *Generalstab des Heeres* (general staff of the army), complained of the current situation:

> I am deeply concerned about insufficient anti-tank defences on the western front. The superiority of the French with regard to combat tanks is remarkable, as it is for their artillery. French army manuals give details of how they will commit their tanks in a broad, sweeping attack. We are fully aware that our PaK can do nothing against the 32t and 70t tanks, of which they have approximately 200 available and can commit these types without any problems. Now the question is how we can increase our front-line anti-tank defences quickly and decisively.

Two weeks later *Generaloberst* Franz Halder (who was involved in all strategic German planning and would succeed Beck in September 1938) as *General der Artillerie* decided:

> a) According to 8.Abt Nr 160/38, in June 1939, 100 le FK 18 will be available. The gun must be thoroughly tested, to investigate whether it can be committed against heavy and super-heavy French tanks; particular attention must be given to the performance of the weapon and ammunition, as well as mobility. These weapons are to be issued to the fortification forces in

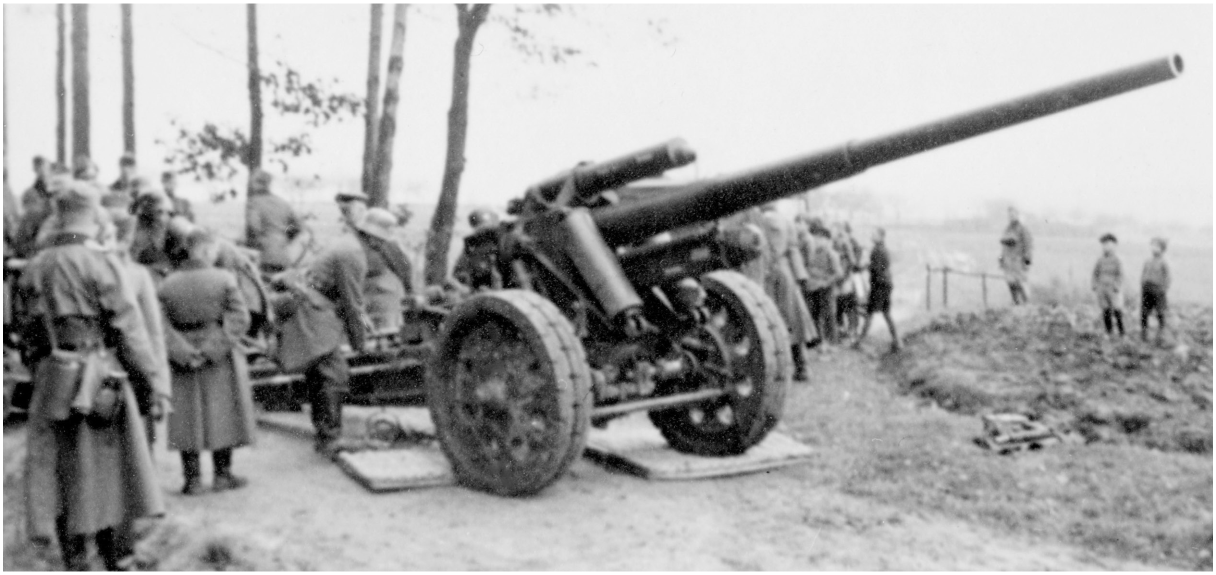


The Rheinmetall-built 5cm PaK 38 was fitted with bullet-proof tyres, common practice on all German anti-tank and artillery guns. The gun was fitted with a double-layer armoured gun shield to protect the crew against fire from infantry weapons. Since the 5cm PaK 38 weighed some 1,016kg, the castor wheel was an essential fitment to allow the crew to position the gun.

the Moselle-Rhine region. We consider it necessary to provide at least 100 Panzergranaten [PzGr – armour-piercing shell] for each gun. This will require the provision of 10,000 PzGr rounds.

b) The question of possibly deploying the 4.7cm Böhler gun cannot be considered before testing its armour-piercing performance. As for their possible allocation, we suggest installing them in border fortifications as described at item a, or to issue them to XII.Armeekorps as anti-tank guns.
c) Beside the le FK 18 and the 4.7cm Böhler gun, the supreme leadership calls for a highly mobile anti-tank defence reserve, able to fight heavy and super-heavy French tanks. For the time being only the '*Panzerjäger*' (7.5cm L/40.8 with a muzzle velocity of 685mps on SP chassis) is available. I request the earliest possible production of enough *Panzerjäger*, including sufficient ammunition, to establish three battalions, each with three companies, for use as *Heerestruppe*.

This note from Halder proves that there was a certain degree of uncertainty about the possibility of war with France. Adolf Hitler considered France to be his arch enemy, holding it responsible for the punitive Treaty of Versailles. He frequently described the country as a feared opponent, mainly to justify his plans for massive re-armament.



Most German artillery units were equipped with various types of field gun and field howitzer, which were of limited use against enemy armour. A number of units were equipped with the heavy 10cm K 18, which had a muzzle velocity of 835mps. When firing the PzGr round, the gun was sufficiently powerful to destroy an enemy heavy tank.

However, both officers considered the French heavy tanks to be a serious threat. In a panic-stricken moment, 100 pieces of 7.5cm *Feldkanone* (Fk – field gun) 38 were sent to the Westwall system of fortifications to reinforce the anti-tank defences against any possible French offensive. These guns, although of relatively modern design, were moved by horse, and lacking tactical mobility, would only be of use in static positions. Even the stock of ammunition was insufficient in 1938.

The heavy calibre 4.7cm Böhler gun was originally intended for use in the Westwall, despite being considered to be an effective anti-tank gun. But in 1938, consideration was given to using the type at army troop level as a mobile reserve.

An urgent call for a half-track *Panzerjäger* armed with a 7.5cm gun is not surprising. Lacking any alternative, when the prototype was first shown it must have appeared as a wonder weapon. Alas, it never did enter mass production.

At around this time consideration was being given to using conventional field artillery to fight enemy armour. Field and anti-aircraft guns have a flat trajectory and could be used to effectively fight tanks at longer range. These heavier calibre guns proved to be capable of defeating even the much-feared French heavy tanks. However, both types of gun were heavy and difficult to move in front-line areas, resulting in no significant improvement in tactical mobility. Another important aspect was that any artillery gun provided for anti-tank defence would be unavailable for its intended role.

However, in the period leading up to the establishment of Germany's Panzer and infantry divisions the responsible military planners concentrated mainly on the 10.5cm *leichte Feldhaubitze* (l FH – light field howitzer) 18 and the 15cm *schwere Feldhaubitze* (s FH – heavy field howitzer) 18.

Only the tank divisions had a limited number of 10cm *schwere Kanone* (s K – heavy gun) 18 in their inventory.

French and Soviet artillery regiments had a mixed establishment of howitzers and field guns. Totally different from the way German artillery was distributed.

However there was a problem: The howitzer fires a shell at a high angle of elevation and a relatively low muzzle velocity. This restricted the use of the type as an anti-tank weapon, making considerable parts of the German artillery ineffective for tank defence duties.

These problems were known to both the *Waffenamt* and O*rganisationsabteilung*, but apparently neither consider it important enough to change the organizational system.

Even without any first-hand experience, the role of all branches of the artillery was considered to be a potentially decisive element in the perceived use of anti-tank defences in the German army. In addition to calling in the artillery, the responsible authorities demanded the formation of effective and highly mobile *Panzerabwehr* units at *Heeresguppen* (army group) level.

Parallel to these considerations, the question of fighting enemy fortifications seemed to have a similar priority. Between 1937 and 1938, German strategists had two major bunker systems in mind:

– The Czechoslovak border fortifications
– The Maginot Line

To cope with these challenges, it was necessary to form specialist units and suitable weaponry for the army, *Luftwaffe*, the pioneers and the artillery. In fact, combat against heavily-armoured pillboxes was considered to be similar to fighting heavy tanks.

The German artillery had two weapons available which proved to be suitable for these special purposes, the 10cm s K 18 and the 8.8cm FlaK 18.

10cm s K18

This weapon was introduced in 1935, at the same time as the 15cm s FH 18 howitzer. Both artillery pieces used the same mounting, carriage and limber. The D 435/7, dated December 1940, noted that only two types of ammunition were available; the high-explosive 10cm Gr 19 round; and the 10cm PzGr *rot* (red), an armour-piercing capped, ballistic capped (APCBC) shell.

The gun had a combat weight of 5.6t, a maximum range of 19,075m, and a muzzle velocity of 835mps, much higher than that of the 15cm s FH 18 at 520mps.

By 1 September 1939, the total number of s 10cm K 18 in service was 402: whereas 2,408 of the 15cm s FH 18 had been delivered.

10cm s K18, Data

Calibre	10.5cm
Barrel length	5,460mm = L/52
Maximum range	19,075m
Muzzle velocity	835mps
Side traverse	60°
Elevation range	0° to 45°
Rate of fire	n/a
Weight in firing position	5.6t
Armour penetration at 100m*	n/a
Armour penetration at 500m*	n/a
Armour penetration at 1,000m*	n/a

*Using 10cm PzGr *rot*

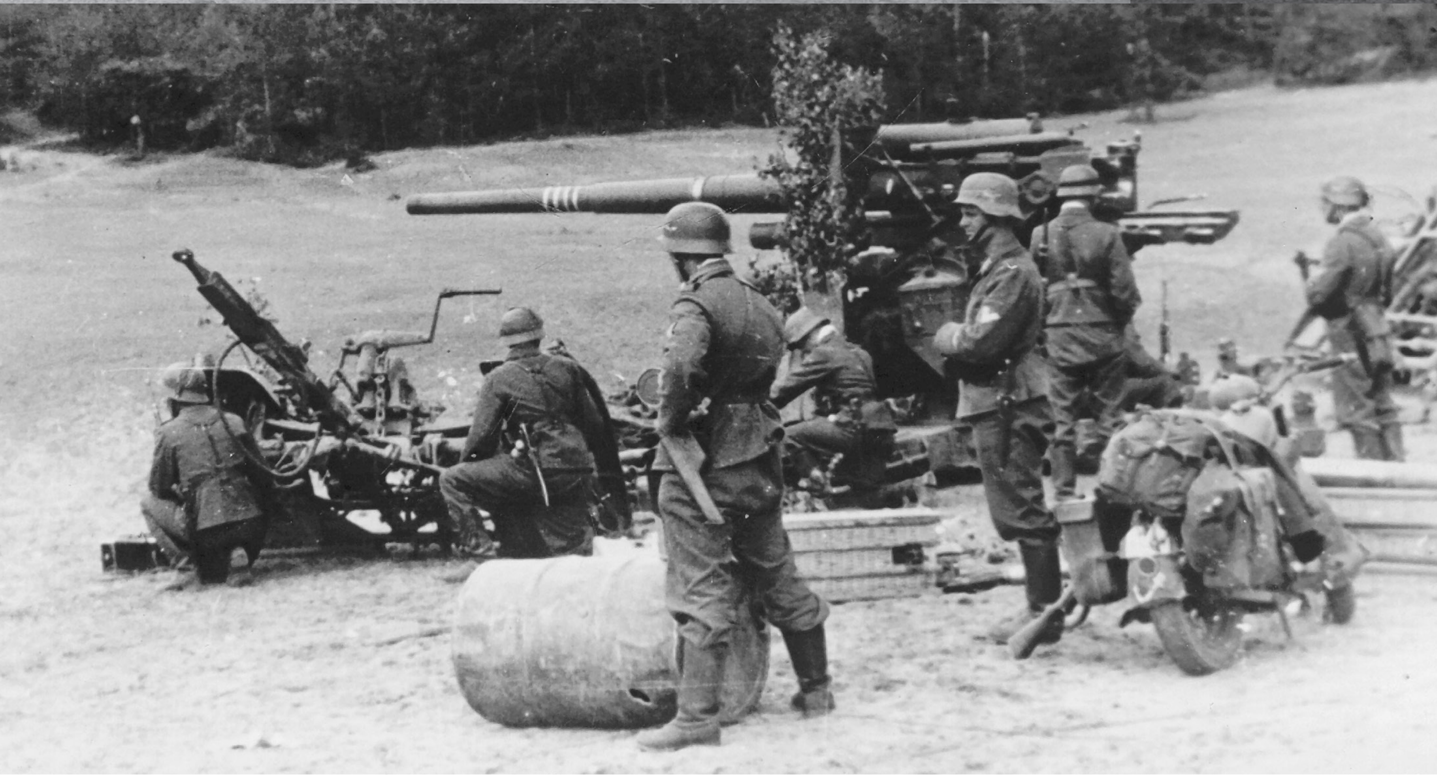
8.8cm FlaK 18

The 8.8cm *Flugabwehrkanone* (FlaK 18) was introduced as the standard weapon for the heavy anti-aircraft batteries. The powerful gun was capable of hitting enemy aircraft flying at altitudes up to 6,000m.

8.8cm FlaK, Data

Calibre	8.8cm
Barrel length	4,930mm = L/56
Maximum range	14,800m
Muzzle velocity	840mps
Side traverse	360°
Elevation range	-3° to + 85°
Rate of fire	20rpm
Weight in position/on trailer	5.6t
Armour penetration at 100m*	128mm
Armour penetration at 500m*	118mm
Armour penetration at 1,000m*	106mm
Armour penetration at 1,500m*	98mm
Armour penetration at 2,000m*	88mm

* Data taken from German files, the gun firing 8.8cm PzGrPatr 39



Little attempt has been made to camouflage this 8.8cm FlaK 18 in an open field position. The towing vehicle has been moved to a safe position, but the road bogies are kept close by, ready for a rapid withdrawal. Note that four 'kill rings' have been painted on the barrel.

Beside the 8.8cm Sprengranate HE round, the 8.8cm PzGrPatr, an APCBC round was excellent for defeating enemy armour. This shell was soon superseded by the improved 8.8cm PzGrPatr 39. Penetration data is given in the respective tables.

Initially, all FlaK 18 were placed under the sole control of the *Luftwaffe*. But due to it having great accuracy and a high muzzle velocity, the resulting impact on the target appeared to make the type ideal for combat against hard targets including armour.

Schartenbrecher – An Expansion of Duties

Initially it was intended to use the highly-accurate 10cm s K 18 and the 8.8cm FlaK guns to fire at *Scharten* (loopholes [firing slots]) in bunkers and fortifications. For this reason they became known as *Schartenbrecher* (loophole breaker) or *Bunkerknacker* (pillbox buster); a name that was applied to a variety of guns and vehicles.

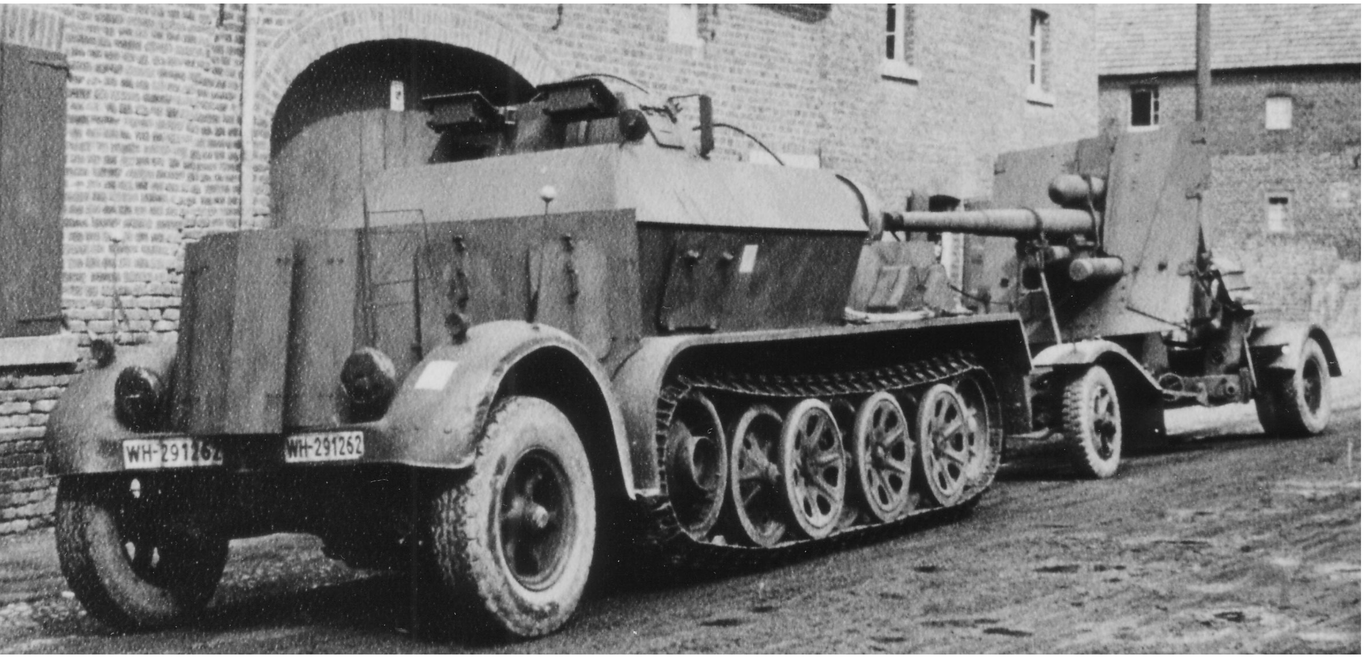
All units equipped with both types of gun would be trained in ground combat, but apparently the gun crews' preferred weapon was the 8.8cm FlaK. Although being heavier for road transport than the K 18, the anti-aircraft gun could be readied for action more rapidly.

The crew of an 8.8cm FlaK 18 prepare to fire on a low-flying aircraft during a training exercise. The height of the gun made it almost impossible to conceal on an open battlefield.

Faced by a growing number of threats, combat missions were soon expanded to include defence against enemy heavy tanks while trials were undertaken to determine the best possible tactics.

On 3 September 1938, the *Oberkommando des Heeres* ordered training to be conducted at the artillery school in Jüterbog. The agenda clearly shows the purpose of the training:

> Subject: Training with the 8.8cm *Flugabwehrkanone* [FlaK – anti-aircraft guns] made available by the *Luftwaffe*.
>
> 1) Between 16 and 17 September 1938 an instructional course will be held regarding the application of 8.8cm FlaK guns for combat against pillboxes and tanks.
> 1) Purpose of the instruction
>   a.) Training of instructors for the mobile *FlaK-Züge* [anti-aircraft platoons]. Subject is the high accuracy firing against ground targets (especially a pillbox).
>   b.) Acquiring practical experiences with the deployment of 8.8cm FlaK guns against ground targets. The personnel will then proceed to training with the 8.8cm *FlaK-Züge* on the military training areas.
> 5) Material required for the instruction:
>   Two guns with tractor and drivers
>   One 1.5-ton truck with driver
>   Two motorcycles with riders



A number of 8.8cm FlaK 18 were modified for deployment against ground targets such as bunkers and other hardened targets. The crew was protected by a reinforced gun shield fitted with fold-out sides, and the side outriggers were shortened to allow the gun to be fired from the trailer. The towing vehicle is an SdKfz 7 half-track tractor, which has been fitted with armoured bodywork.

The 8.8cm Flak-Züge mentioned were to become part of specialized *Heerestruppen* (units on army level), but the experience gained was most certainly passed on to *Luftwaffe* FlaK instructional units.

After adoption of the 8.8cm FlaK for *Heerestruppen* purposes, the *Waffenamt* ordered development and limited production of 8.8cm guns purposely adapted for the planned commitment. Two versions are known:

8.8cm *gepanzerte* FlaK (Armoured AA Gun)

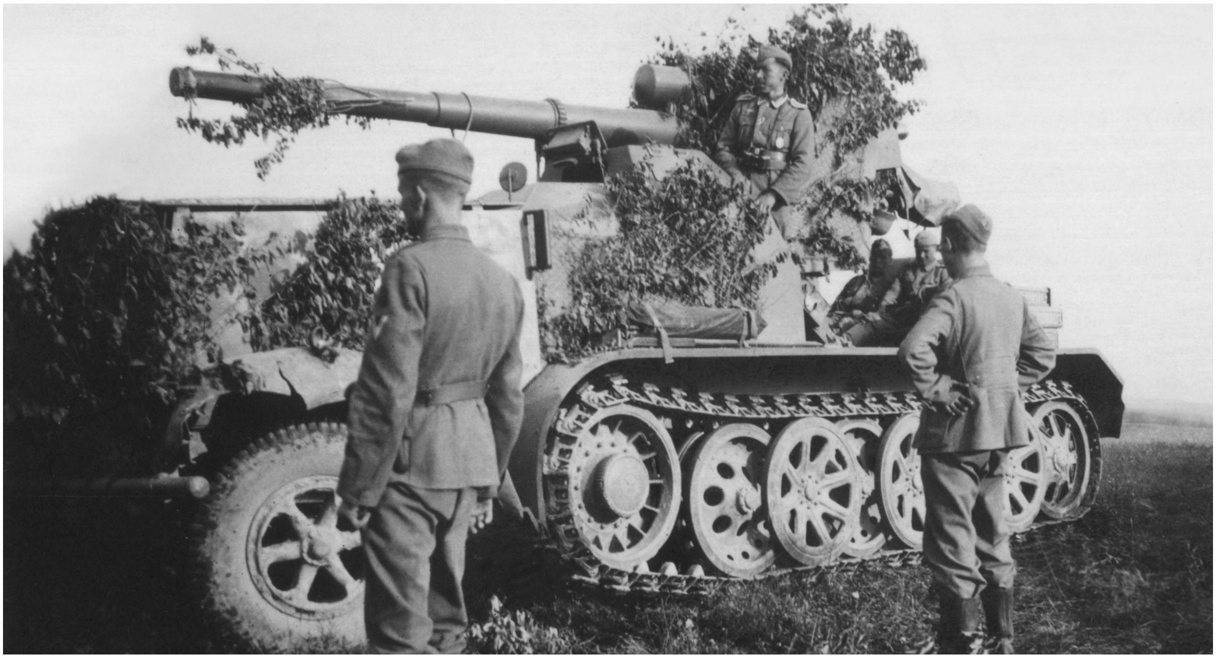
This version was to be towed by a partly armoured *mittlere Zugkraftwagen* (m ZgKw – medium tractor) 8t (SdKfz 7). A standard 8.8cm FlaK 18 normally transported on the SdAnh 201, was heavily modified. The gun shield was removed and replaced by a smaller rectangular-shaped item fabricated from slightly heavier armour. Due to the expected type of target to be attacked, the elevation range of the gun barrel was reduced. An ammunition rack containing six rounds was mounted on the left-hand side of the gun shield. A small platform supported the loader, and the gunner was provided with a small seat. Since it was a basic requirement for the gun to be rapidly brought to readiness, the foldable outriggers were replaced by shorter ones to allow them to fire from the SdAnh 201 trailer. A total of 33 FlaK 18 were thus modified.

8.8cm FlaK *auf Selbstfahrlafette* (on SP Carriage)

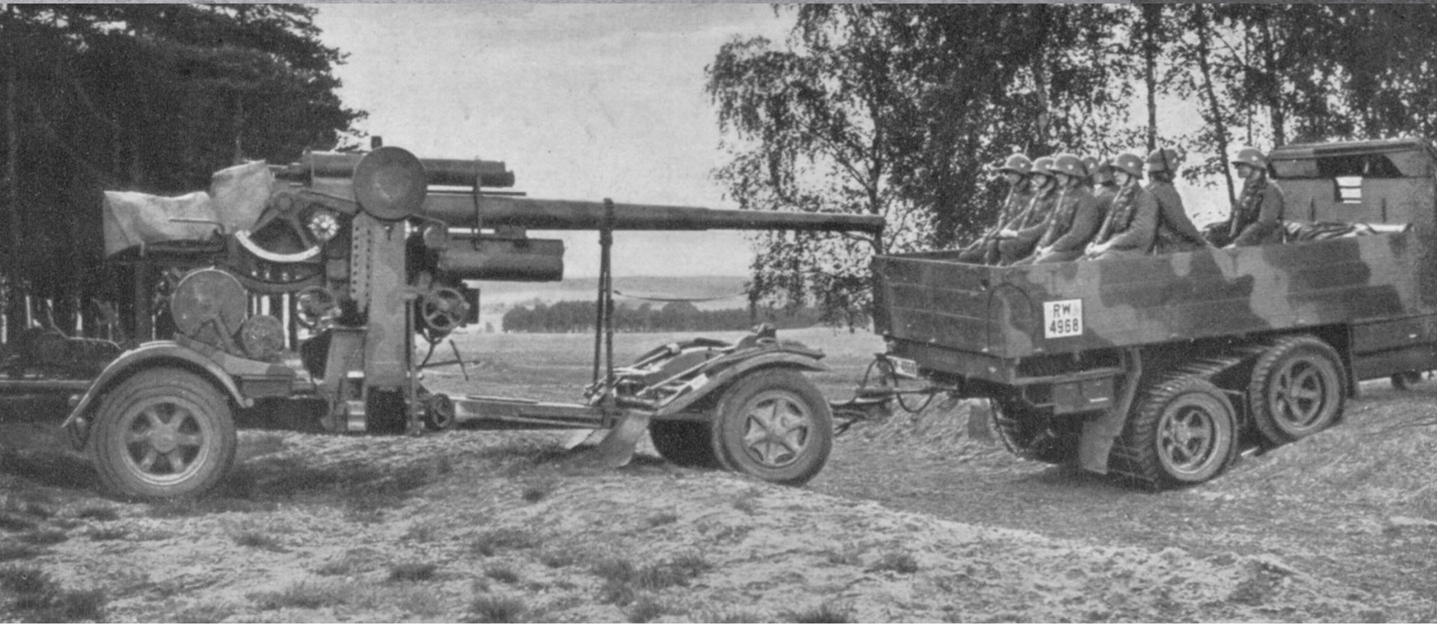
A further ten FlaK 18 guns were modified to the same standard, but were mounted on the chassis of a *schwere Zugkraftwagn* (s ZgKw – heavy tractor) 12t (SdKfz 8). The vehicle was also partly armoured to protect members of the crew from infantry fire.

On 19 September 1938, an instructional leaflet for the modified 8.8cm FlaK 18 was issued:

> Rules for the commitment of mobile 8.8cm FlaK platoons against ground targets
>
> 1) Combat missions:
>   Combat and destruction of pillboxes
>   Anti-tank defence
> 2) Organization:
>   As platoons equipped with two guns towed by 8t ZgKw or mounted on 12t ZgKw.
> 4) Combat missions:
>   B.) Combat against tanks will take place in platoon strength or by a single gun. Due to the high profile of the gun any commitment has to be ordered almost instantly. Gun positions have to be reconnoitered and their position must always be made known to the leaders. In the first instance *Panzergranaten* will be fired.



Mounting the 8.8cm FlaK 18 on the chassis of an SdKfz 8 half-track tractor resulted in a vehicle with a very distinctive and high profile. But these disadvantages were outweighed by the superior mobility of the *Bunkerknacker* when compared to a towed *BunkerFlak*.



An 8.8cm FlaK 18 gun being towed by a heavy truck over a military training area: Note that *Traktionsketten* (traction tracks) has been fitted on the rear wheels of the truck to improve grip. The vehicle is camouflaged in the early *Buntfarbenanstrich* (multi-coloured paintwork) used by the *Reichswehr*.

5) Technical data:
Speed off road: 10 to 15kph
Height to the upper edge of the gun shield:
Gun towed by 8t ZgKw: 2.9m
Gun mounted on 12t ZgK: 3.65m
First allotment with ammunition
50 SprGrPatr HE rounds
150 PzGrPatr AP rounds

The leaflet gave armour penetration data for firing 8.8cm PzGr and 8.8cm SprGr. The differences to the above shown table result from usage of the less powerful 8.8cm PzGr instead of PzGr 39.

Range	**500m**	**1,000m**	**1,500m**	**2,000m**
a.) 8.8cm PzGrPatr at 70° to 90° against a tank	71mm	67mm	65mm	63mm
Against concrete	1,100mm	1,000mm	900mm	800mm
b.) 8.8cm SprGrPatr against a tank	28mm	25mm	23mm	20mm

By the beginning of 1939, a total of ten 8.8cm FlaK 18 Sfl had been delivered and were issued to 1.Kp/PzJgAbt 8, seconded to 1.InfDiv, rather than as an independent unit at army troop level.

Poland

4

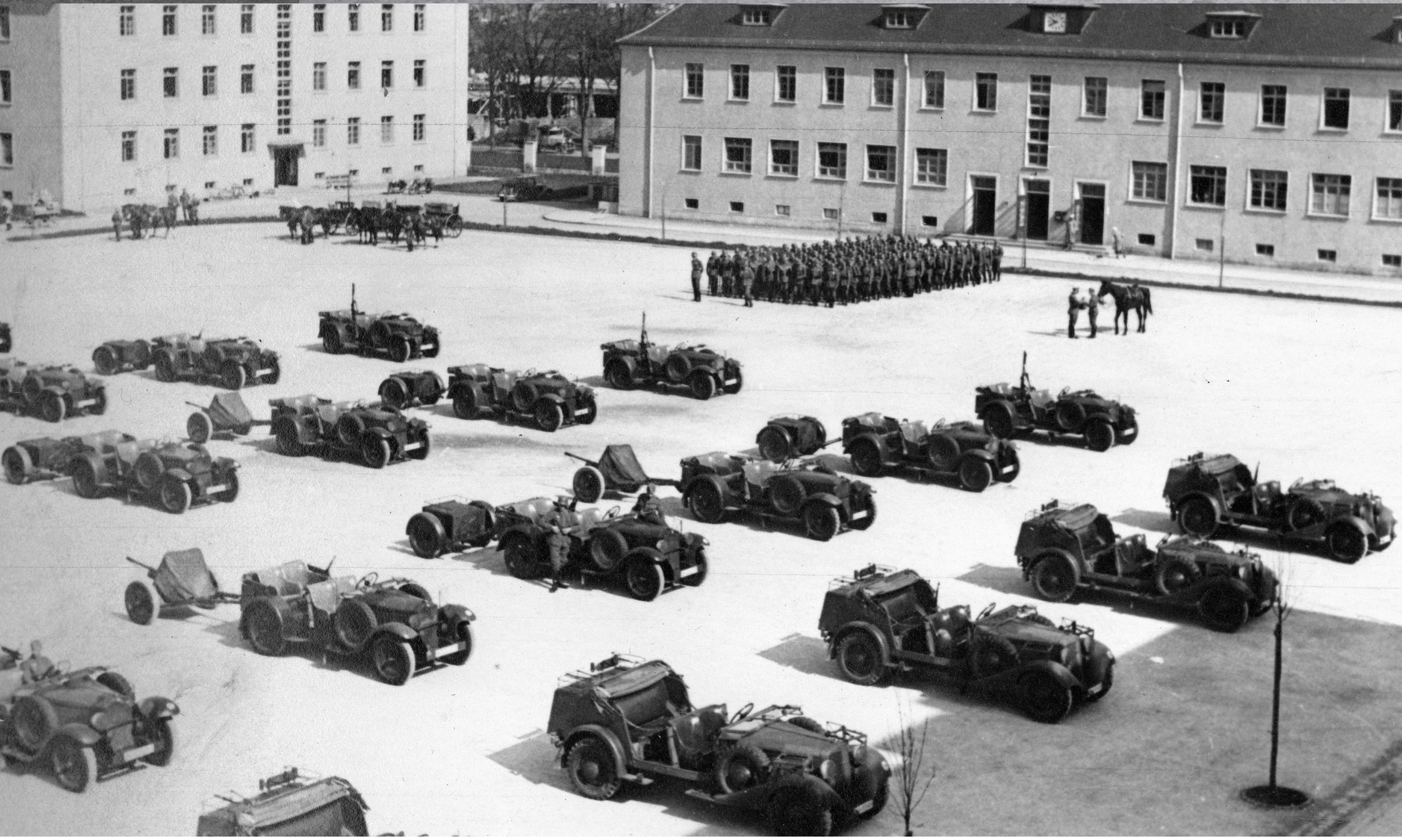
At 5.45 on the morning of 1 September 1939, massed German forces crossed the border of Poland; the trigger to start World War II had been pulled.

German forces proved to be superior in number (some 1,250,000), training and the quality of their equipment. Even if the ’18-day campaign’, as the German propaganda called the invasion, lasted until the beginning of October, the general tactical principles employed by the German army would prove to be effective. Well organized and flexibly led formations won many decisive battles before the Polish were able to fully activate their army. Despite many initial problems, the momentum of the attack continued at a pace which gave rise to the legendary term *Blitzkrieg* (lightning war). At the same time as Poland was collapsing, on 17 September the Soviets launched an attack aimed at occupying eastern parts of the country.

Luck was on the side of Hitler and his forces. Three days after the invasion only some 23 German divisions, all of them classified as second-class due to their insufficient equipment, were available on the border with the Low Countries and France. Germany did not have the reserve forces to fight a war on two fronts. At his trial in Nuremberg, *Generaloberst* Alfred Jodl frankly admitted that ‘we already would have failed in 1939, if the estimated 110 French and British divisions were not kept passive’.

A further inevitable result was that Hitler now had so much confidence in his own strategic capabilities, that an attack through the Low Countries to France was only a question of time. However, the general staff of the army were not convinced as they felt that the forces of France and Great Britain were too strong to fight.

A German anti-tank gun team defending a road junction during *Fall Weiss* (Case White) the invasion of Poland: The Polish army was equipped with a large number of lightly-armoured tankettes which were easily defeated by fire from the 3.7cm PaK. The 7DP light tank was more difficult to combat, but only a few were available to the defending forces. (Getty)



Elements of a 1939-style *Panzerjäger-Kompanie* on the parade ground of their garrison. A 3.7cm PaK would be towed by a civilian-type 4x2 motor vehicle, with another towing a *Sonderanhänger* (SdAnh – special purpose trailer) 32 carrying ammunition. Escort was provided by a similar vehicle armed with a *Maschinengewehr* (MG – machine gun) 34 on an anti-aircraft mounting.

Panzerjäger in Poland

In 1939, the 3.7cm PaK was the mainstay of the *Panzerjägertruppen*, tank destroyer units. The gun had proven capable of easily defeating Polish tanks, the majority of which were tankettes with 14.5mm armour. Only the few available 7TP light tanks were serious opponents.

The performance of the weapon and the German tactical principles proved to be sufficient to win the battle.

On 29 September, General Heinz Guderian, commander of XIX. Armeekorps, submitted an experience report:

> XIX.Armeekorps was formed of 3.PzDiv and the 10.PzDiv (having only one tank regiment), and the 2.InfDiv (mot) and 20.InfDiv (mot).
> PaK and FlaK guns were successfully used to defeat bunkers positioned near the rivers Narev and Vizna, and at Brest.

However, although having been in active service for several years, the weapon still had a number of shortcomings. The *Feldzeugkommando* (ordnance command) II Stettin reported on 21 August 1939, ten days before the attack:

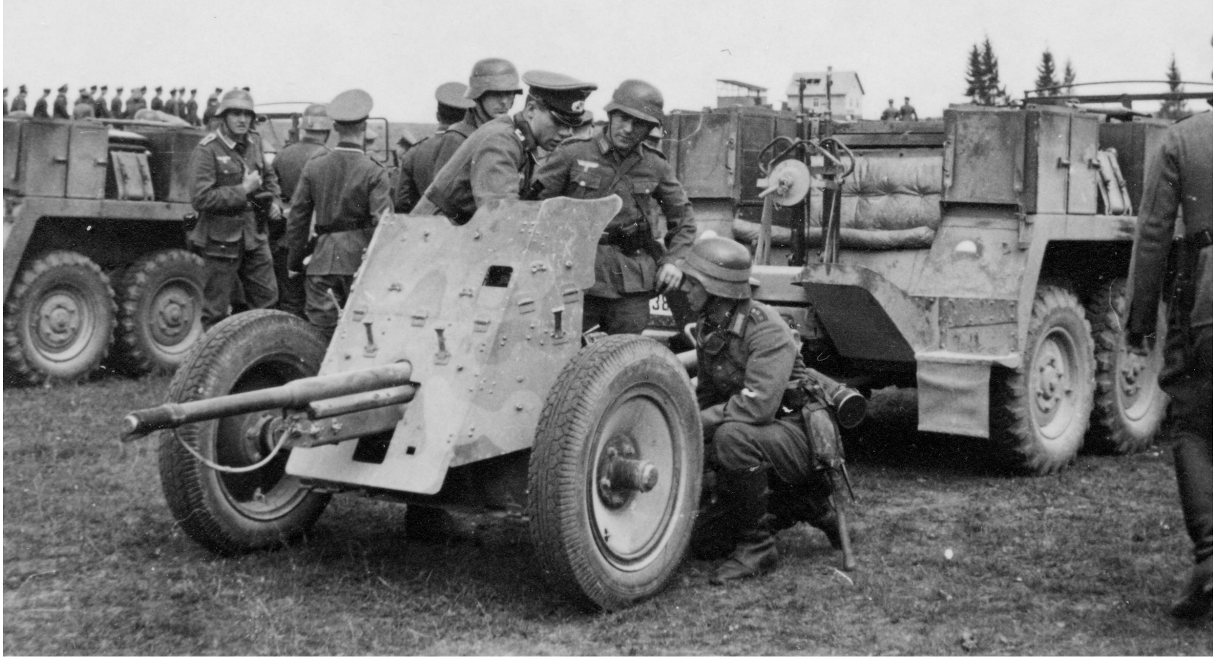
1) We urgently request the shipment of eight left and right swing axles for 3.7cm PaK. Reason: The replacement axles on two of the PaKs supplied by GenKdo II AK have already broken.
2) Also 32.Div reported that by mid-June the two trails on a PaK in InfRgt 96 have broken. We are still awaiting the requested delivery of new trails.

On 13 September 1939, 23.Div reported:

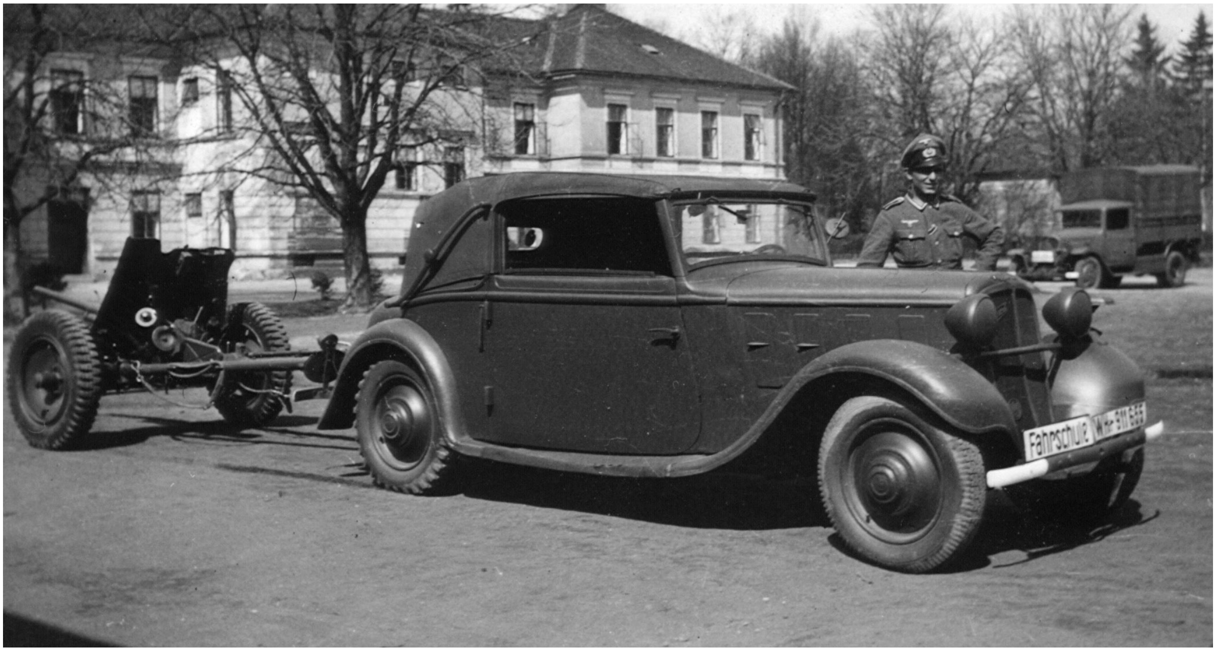
> From an after-action report by 23.Div on the campaign in Poland from 26 August to 21 September 1939:
>
> Commitment of heavy weapons:
> We request the delivery of HE ammunition for our PaKs to allow combat against machine-gun positions and other targets in built-up areas. However, even without this ammunition the PaK had proven most effective against infantry positions and attacking infantry. The effect on morale was considerable.

This was seconded by a report of 2.GebDiv dated 7 October 1939:

> PaK: Introduction of a *Sprenggranate* (HE round) with a sensitive fuse for use against infantry targets (especially machine-gun nests) is necessary. Being able to combat such targets with HE rounds, the PaK could have been used with



In contrast to the infantry, the *Panzerjäger-Kompanie* (PzJg-Kp – anti-tank company) in a Panzer division was to be issued with the Krupp-built *Protzkraftwagen* (Kfz 69); a vehicle powered by a 3,308cc Krupp M304 air-cooled horizontally-opposed four-cylinder petrol engine. The light artillery tractor (Kfz 69) version was designed to carry the gun crew and ammunition (180 armour-piercing and 36 high-explosive rounds). Both the gun and tractor are camouflaged in the three-tonne *Buntfarbenanstrich*.



As the war proceeded, home garrisons continued with the training of new soldiers, but due to a shortage of suitable military-type vehicles civilian cars were commandeered. Here a light passenger car, carrying a *Fahrschule* (driving school) badge, is being used to tow a 3.7cm PaK: Note the rear wheels have been cross-country tyres to improve traction.

> great success as an assault gun, and would have been a very popular weapon during the Polish campaign. Due to the lack of suitable ammunition the PaK was little used, since tanks were not encountered.
>
> The swing axles of the 3.7cm PaK are too weak and continuously tend to break. To improve performance we consider it necessary to introduce a muzzle brake as on the Polish 3.7cm Bofors anti-tank gun.
>
> The *Panzerabwehrwaffe* was never used to full effect. The weapon itself was very useful in combat against enemy infantry. The introduction of the HE round increased its effect considerably. The PzJg-Abt was deployed like a *schnelle Abteilung* (rapid battalion), but lacked the prowess of the infantry.

The 3.GebDiv added:

> Organization and performance of the anti-tank defence was satisfactory (eight enemy tanks confirmed as destroyed).

The Artillery in the Anti-tank Defence Role

It is virtually impossible to assess the role of the field artillery in the anti-tank defence role during the Polish campaign. In an emergency situation, all available field guns and howitzers were called into action against enemy tanks.

In Poland (and for much of the war), the artillery in infantry divisions still relied on the horse to move guns. A truly mobile deployment was hardly possible, especially when the s K 18 gun alone weighed some 6 tons. Most possibly this was the why the le FH 18 was the most frequently used artillery piece for the anti-tank role.

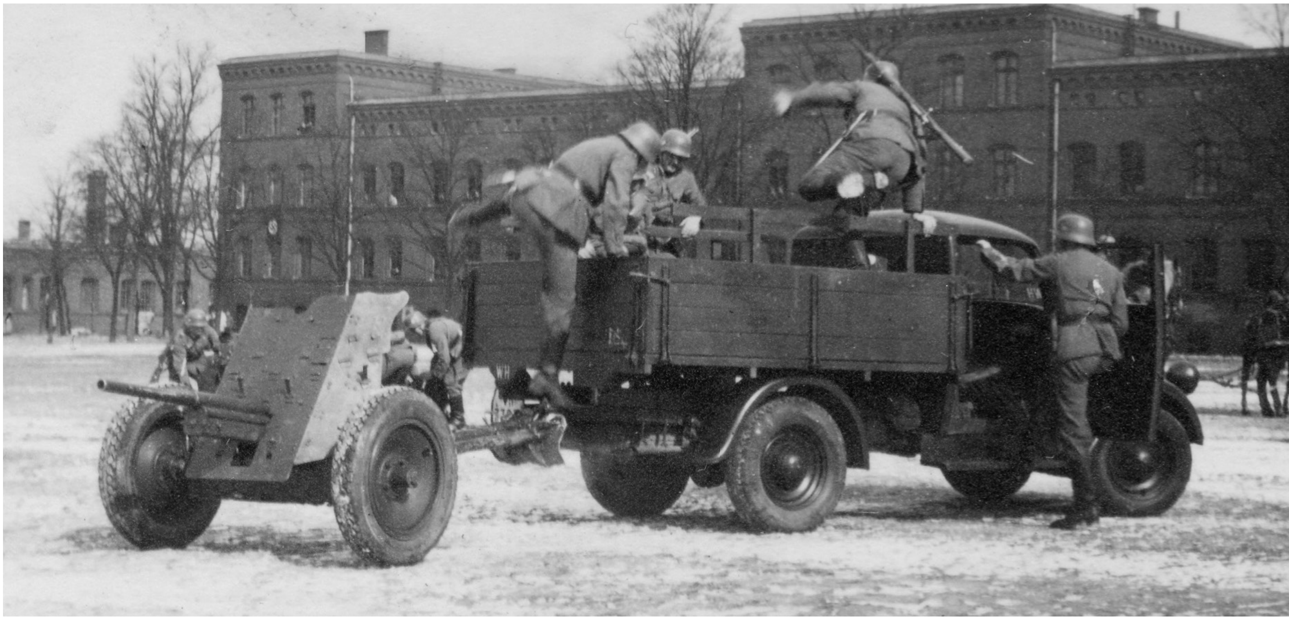
The lack of a 7.5cm field gun at divisional level became more of a problem. At around the same time, other nations had closed this gap by producing better guns; Great Britain with the Ordnance QF (quick firing) 25 pounder: France with the *Canon de* 75mm *Modèle* 1897 and Russia with the 76mm M 1939.

However, since the Polish army had mainly light tanks, deployment of German artillery was to support the infantry.

The same applied to a number of heavy FlaK batteries deployed by the *Luftwaffe*. An exception was 1.Kp/PzJgAbt 8 – a special unit attached to 1.InfDiv – which had ten 8.8cm FlaK guns mounted on heavy half-track vehicles.

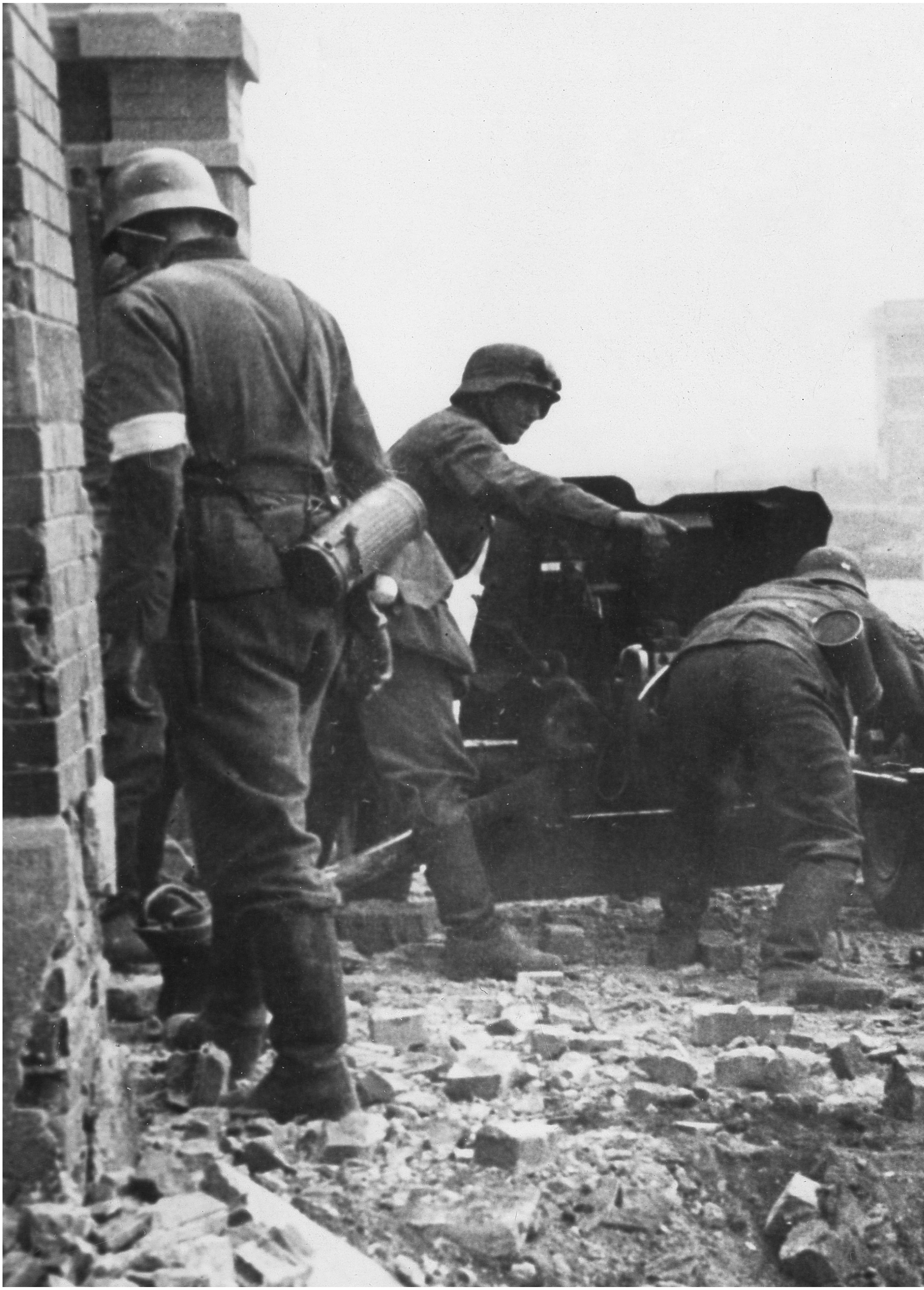
On 13 October 1939, an after-action report was submitted by 8.Div covering their deployment in the Polish campaign:

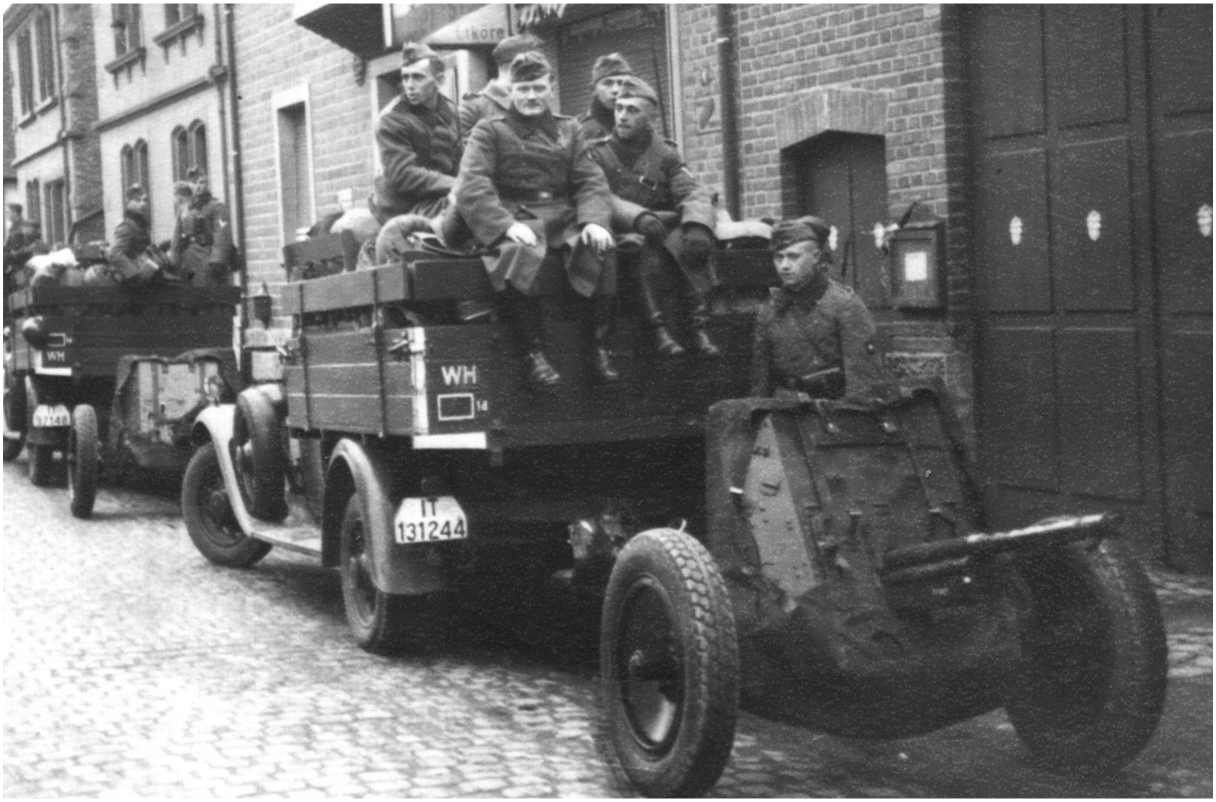
> 1) General
>
> The German principles for training and tactical deployment, the German organization and German weaponry have been fully proven.
>
> The shortage of German cavalry was bitter loss for the combat in the east. In general, our ordnance was too heavy; the available horses too light and there were too few. Our cross-country vehicles have proven in general to be



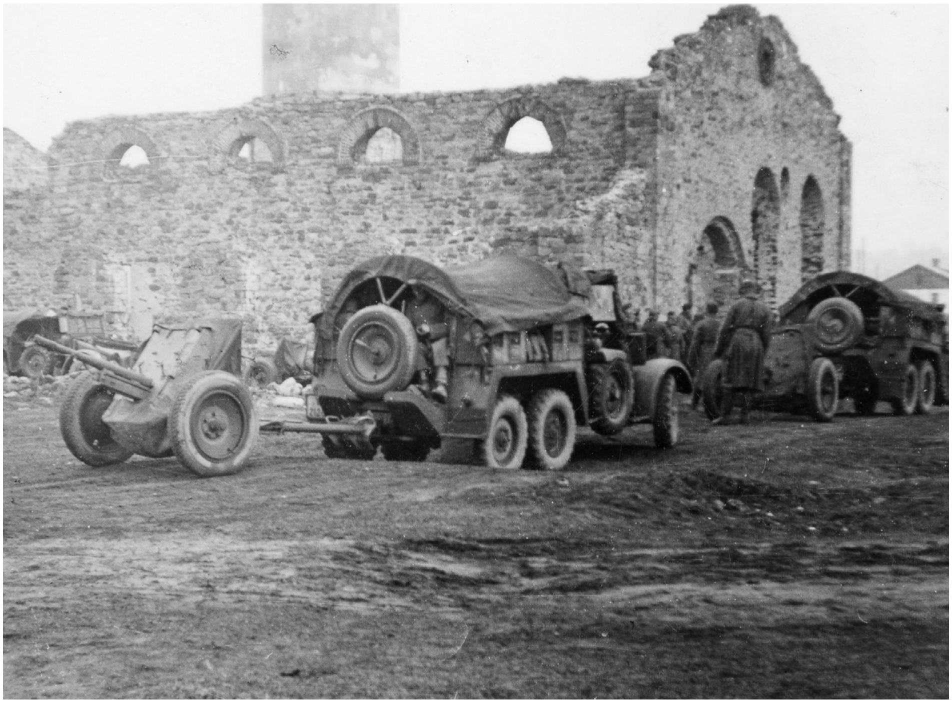
The Opel Blitz 1.5-ton light truck was supplied in large numbers to the *Panzerjäger*. The type was far less complicated and more economical to build than the highly-specialized Protzkraftwagen.

On a paved road the spades at the end of the gun trails could not be dug-in to absorb recoil forces. The armoured gun shield provided some protection for the crew against fire from enemy infantry weapons. For an unknown reason, the *Geschützführer* (commander) wears a white arm band. (Getty)

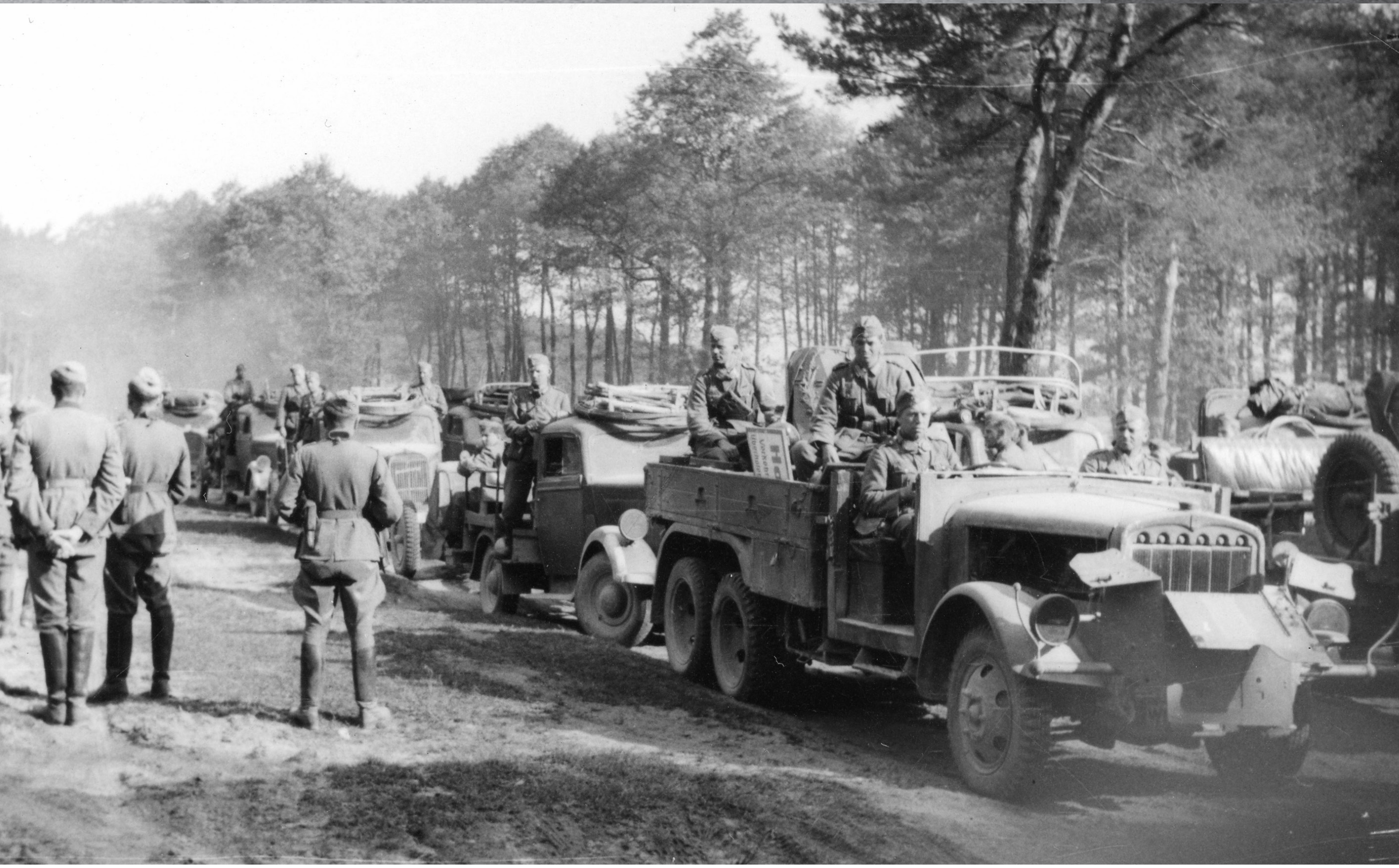


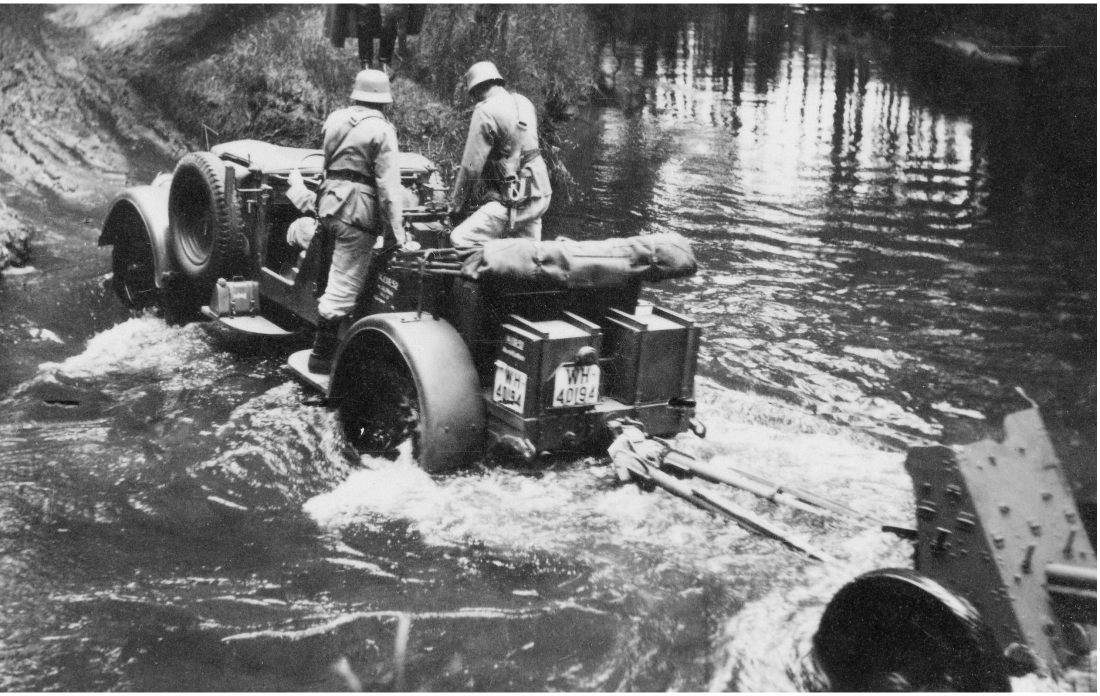


Above: These commandeered Opel 1.5-ton trucks, still fitted with civilian-type license plates, are in service with the 14.Kp of an infantry regiment. Note that each PaK is fitted with a protective cover.



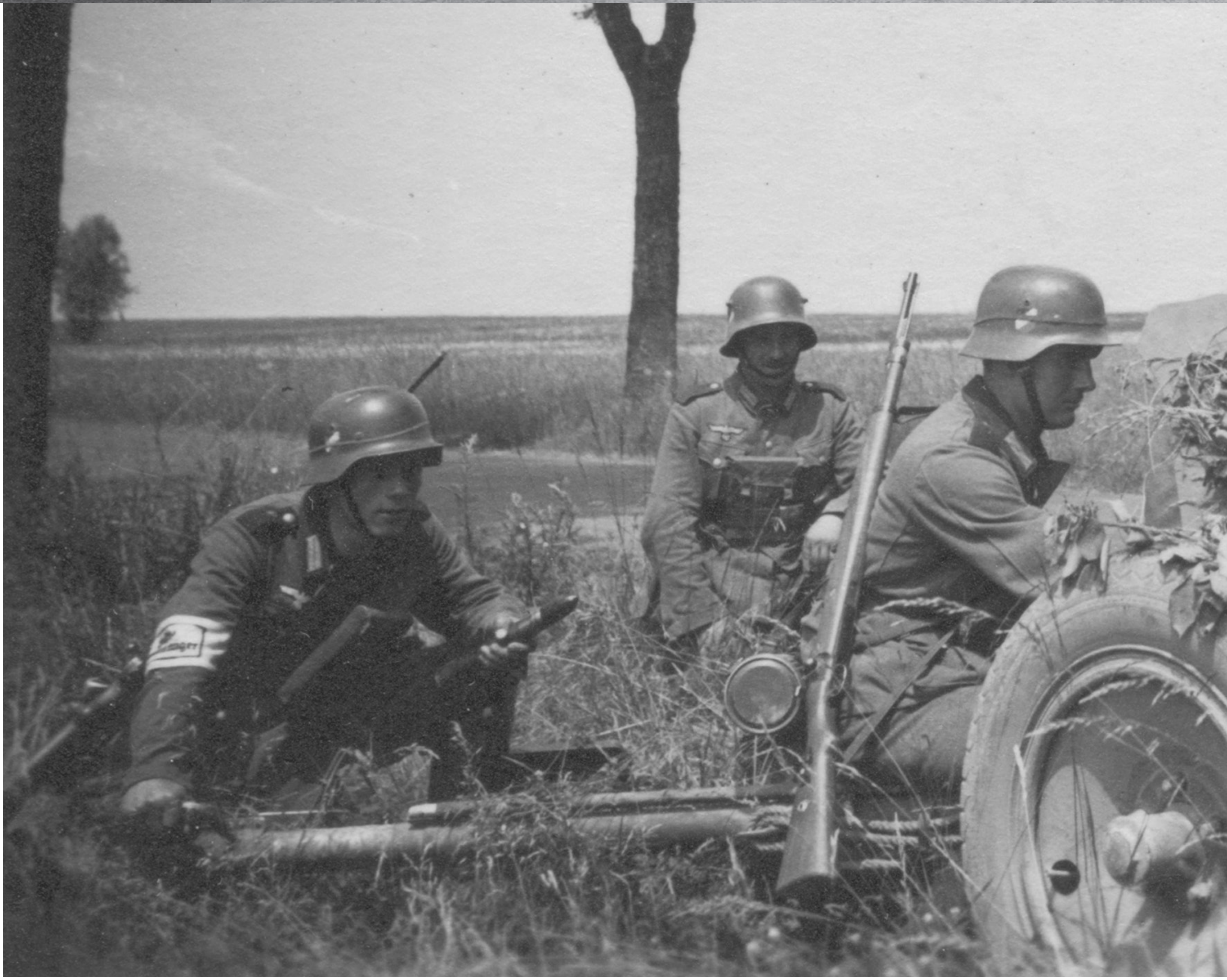
Right: A column of Protzkraftwagen (Kfz 69) towing 3.7cm PaK anti-tank guns; all have their foul-weather covers fitted.





Above: The difficult vehicle supply situation for the German military forced them to utilize any available vehicles and this led to a great diversity of types in service. The lead vehicle is a Henschel Typ 33 heavy truck which was often used to transport a 3.7cm PaK 'Portee'. Note a gun shield has fitted in front of the radiator.

Left: The Adler 3GD (Kfz 12) field car was adapted from a civilian passenger car into a towing vehicle for the 3.7cm PaK. The type carried a driver and the three-man gun crew. A similar vehicle would be used to tow the ammunition trailer.



A well-camouflaged 3.7cm PaK in an ambush position at the side of a country road; although a severe impediment, each member of the crew had to carry a 98k rifle. Close to the muzzle the *Geschützführer* (commander), an *Unteroffizier* (NCO), carries a *Stielhandgranate* (stick grenade).

satisfactory. Commercial passenger cars lacking cross-country mobility were more of a burden than a help. The weather was remarkably fine during the Polish campaign. With steady rainfall allotted targets would not have been reached.

3) *Maschinengewehr* 34, light and heavy Granatwerfer proved to be useful, their impact was very good. The le FH 18 performance was very good and when it's harnessed to strong horses the gun is not too heavy. The s FH 18 has shown considerable impact in the target, but is far too heavy for the commitment in the east. POWs often witnessed the excellent accuracy and devastating effect of German artillery fire.

The axles on the 3.7cm PaK are too weak and have a frequent tendency to break.

> The 8.8cm FlaK *auf Selbstfahrlafette* [on self-propelled (SP) chassis] proved to be most effective as a modern infantry assault gun (compare to 1918). Their morale and actual effect was extraordinary. These weapons were the first choice to press forward the advance of a bogged-down assault. However, the gun should be provided with armour protection to protect the crew from infantry fire.
>
> Many motor vehicles performed badly due to the speed of our advance, and over time most of the motorcycle failed. The commercial-type vehicles were of no use on unpaved roads or sand tracks. Rear-wheel-drive vehicles were a total failure, while all-wheel-drive vehicles performed as expected.

The unknown author of this note describes the all-too-familiar problems regarding the quality of support equipment allotted to the infantry divisions. In the artillery, even the 15cm s FH 18 still was moved by a team of horses. The shortage of supply and the poor reliability of transport vehicles would be a problem which continued until the end of the war.

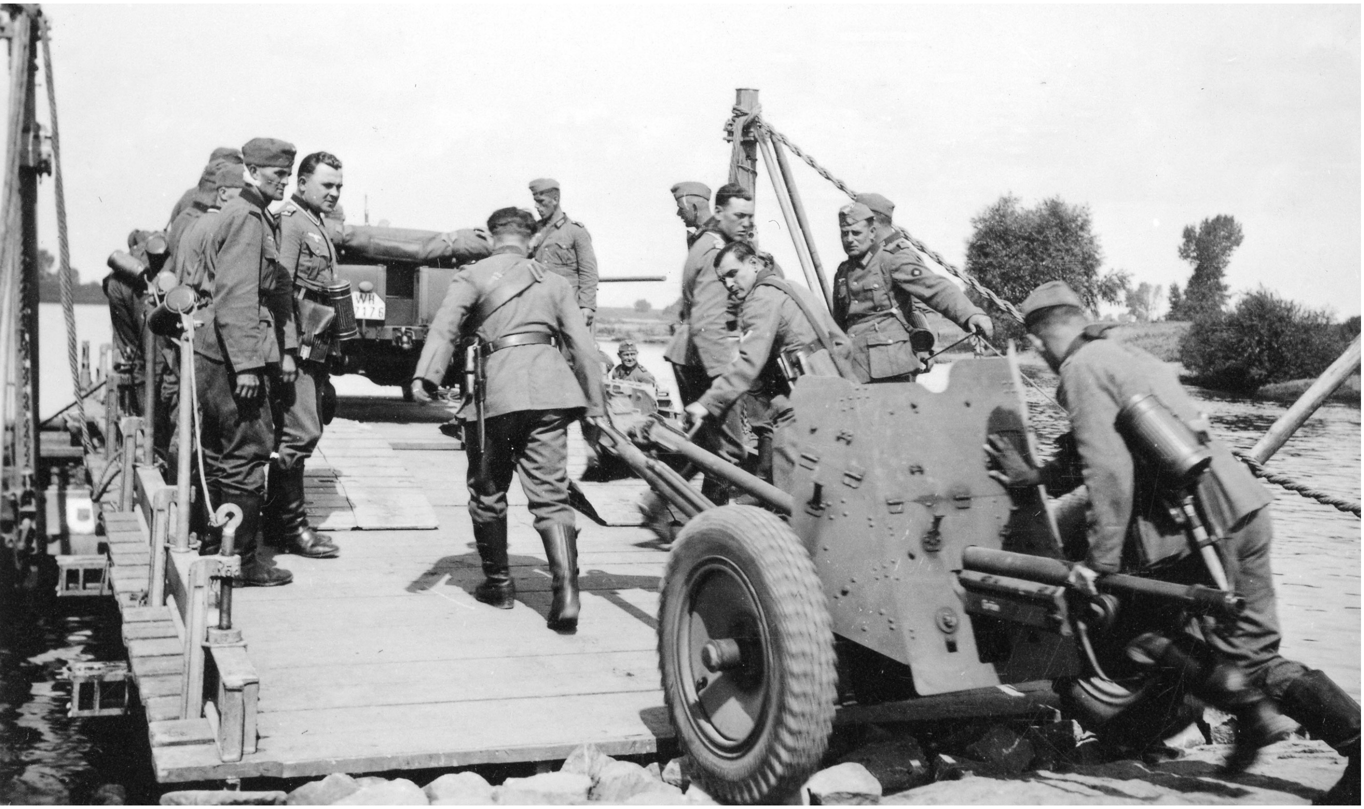
However, with regard to the *Panzerjäger*, it is interesting to note that the report does not mention how well the tank destroyer subunits performed, or the quality of the 3.7cm PaK. Possibly the only plausible reason is that Polish tanks were either regarded as being of no consequence, or that the number encountered was negligible.

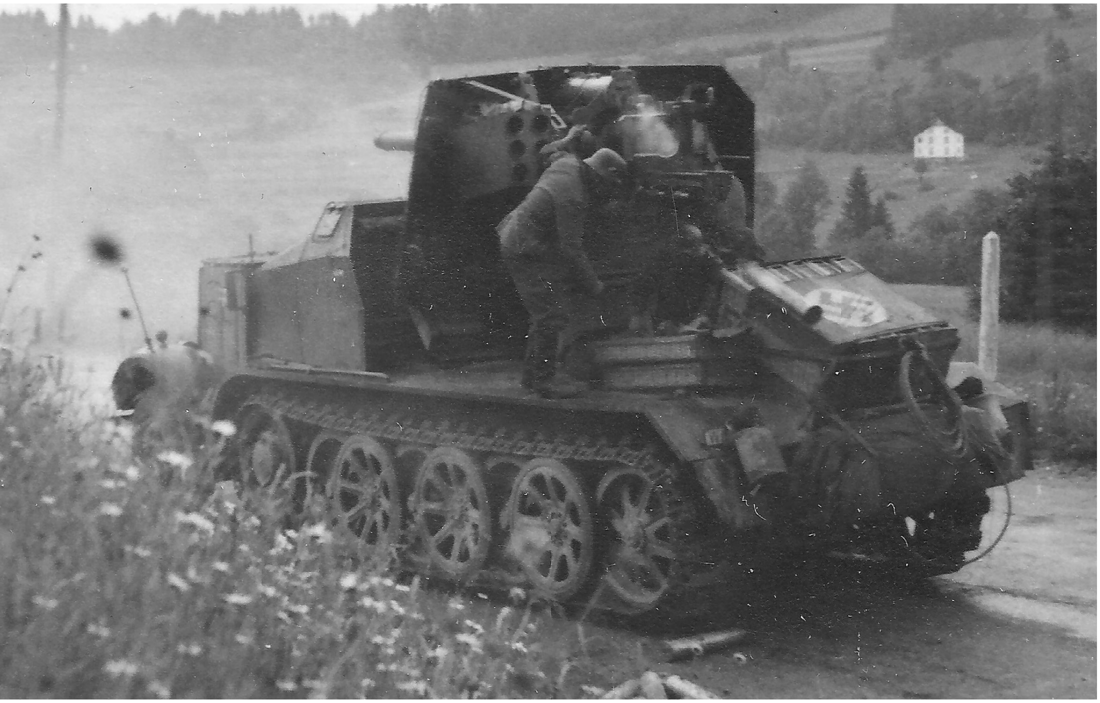
The division's most destructive weapon, the *Bunkerknacker* of PzJgAbt 8 was apparently used for the same purposes as the later *Sturmartillerie*. Despite their very thin armour, the 8.8cm FlaK 18 Sfl were used to attack and destroy enemy gun positions. A better organized enemy would have destroyed these poorly protected types or at least made an attempt. However, the morale of the Polish defenders had been shattered by the *Blitzkrieg*, and any attempt to bring sufficient heavy guns into action was out of the question.

Resume

The invasion of Poland was possibly an unsuitable example to test the true abilities of the German *Panzerabwehrtruppe*. All in all, the Polish army was organized and led according to structures which were completely outdated

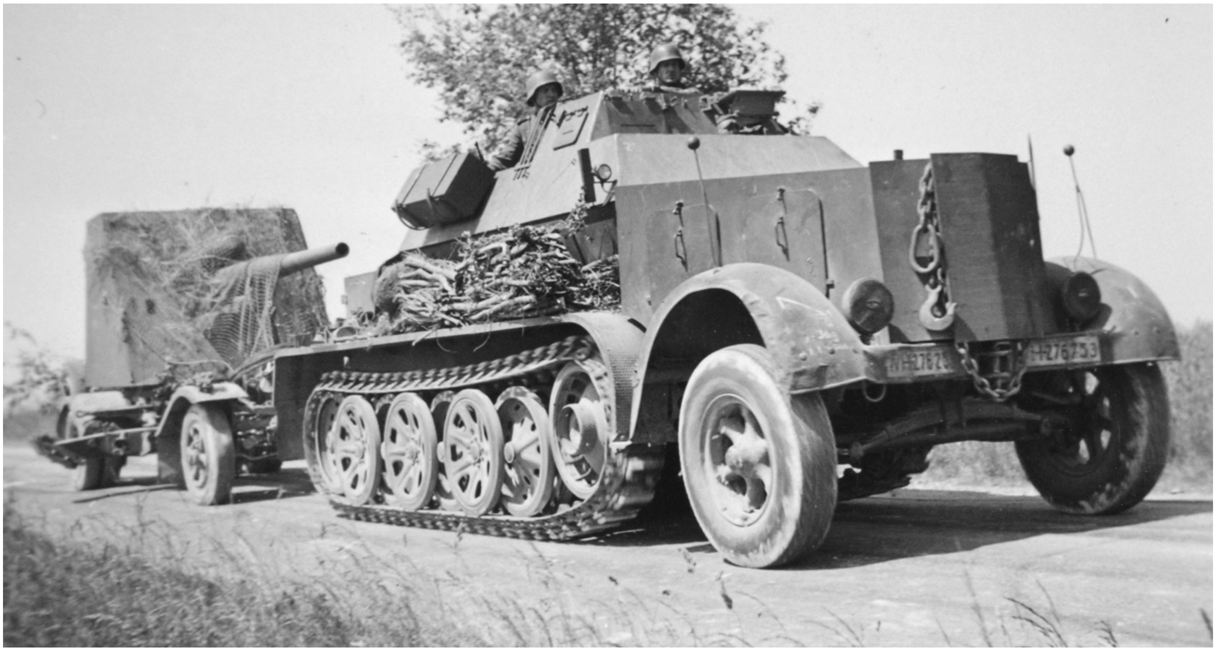
A PzJgAbt 4 gun team with their well-camouflaged 3.7cm PaK; the gun would not be able to go into action covered in so much foliage.





Above: A gun team manhandles their gun onto a *Pionierfähre* (pioneer ferry) to cross a river. The towing vehicle has been loaded separately.

Left: A massive *BunkerFlak* in action: on the left of the gun is a six-round ammunition rack. The gunner is on the right-hand side of the gun; at the left, the loader feeds a shell into the breach ready for the next shot. Extra ammunition was stored in wicker baskets mounted on the rear of the vehicle.

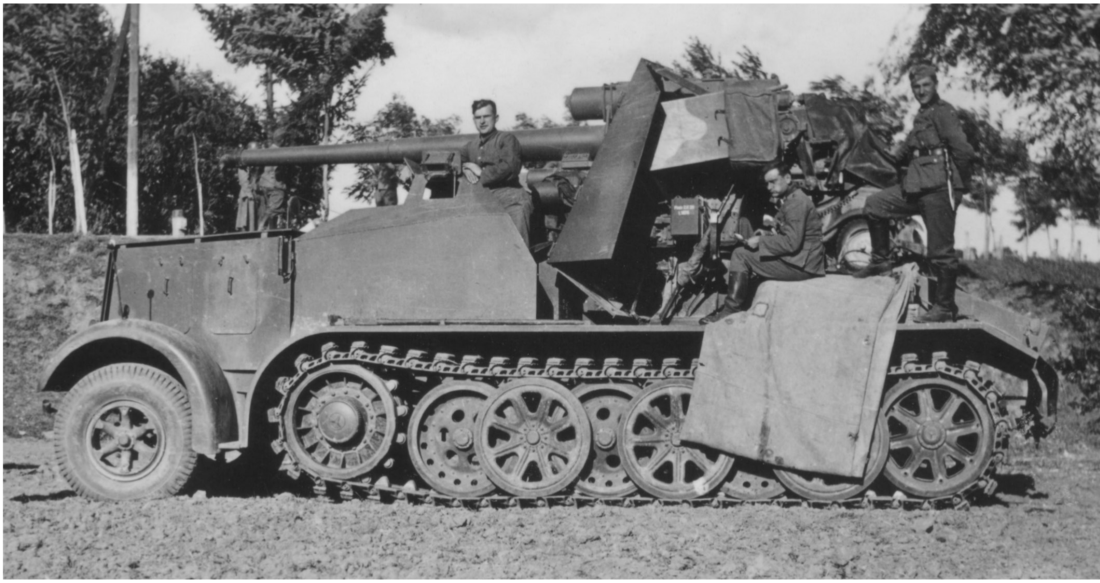


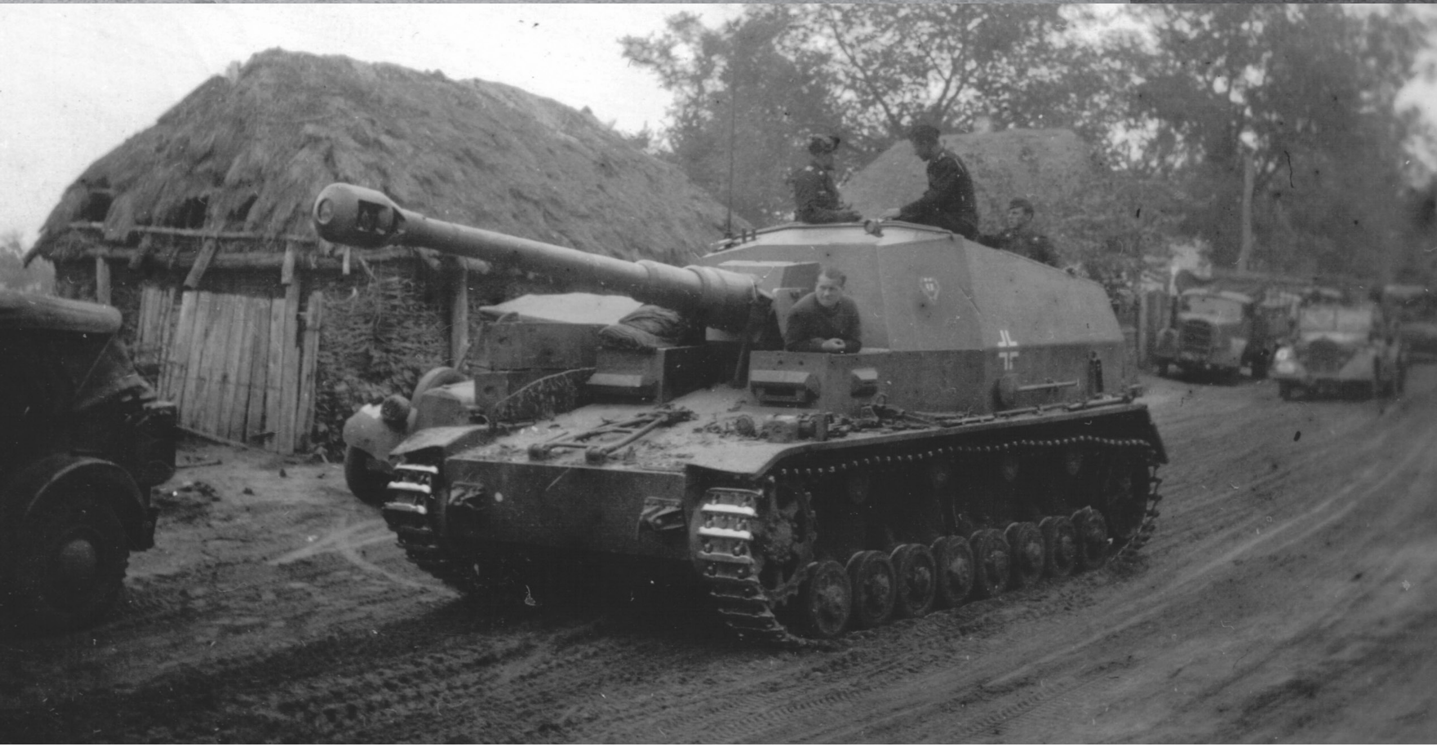
Above: A second version of the 8.8cm FlaK 18 *BunkerFlak* entered service at the end of the Polish campaign. The gun was towed by a partly armoured SdKfz 7 half-track tractor, and although it was a formidable weapon it lacked tactical mobility.

Right: The 8.8cm FlaK 18 mounted on an SdKfz 8 half-track tractor proved to be a more successful weapon. Armour plates have been fitted to the engine compartment and also the driver´s position. A modified gun shield has also been fitted.

by 1939 standards. It was not equipped with sufficient modern, powerful weapons that might put up an effective resistance to a well-armed aggressor like Germany.

Also this substantial organizational weakness was a piece of good fortune for the attacking Germans, whose fighting men lacked any experience of actual combat.





Before the Polish campaign it was acknowledged that the rapid destruction of an enemy's defensive bunker systems was essential in any coming armed conflict. With this in mind, military planners ordered the development of a heavy *Schartenbrecher*. The vehicle was built on the hull of a PzKw IV and mounted the 10cm Kanone 18, and was ready for combat in the imminent *Unternehmen* Barbarossa.

Armed with the 3.7cm PaK, all tank destroyer units were specialists in their allotted task of defending against attacks by enemy tanks.

The degree of mobility of the PzJgAbt in infantry, mountain and tank divisions, and also their 14.Kp cannot be assessed. However, it is very likely that a highly mobile tank division was equipped with the Krupp-built *Protzkraftwagen* (SdKfz 9) as towing vehicle, when many infantry divisions had to rely on half-militarized 4x2 passenger cars.

A full conversion to powerful half-track vehicles, such as the le ZgKw 1t (SdKfz 10), for towing would have improved the mobility for *Panzerjäger* units and also considerably increased their combat value.

Mechanical failures of the swing axles and the very delicate trail arms on the guns were familiar long before the outbreak of the war; but it is not known whether these problems were ever solved.

Many after-action reports observe that the small guns proved to be effective for their intended role. However, the combat value of the *Panzerjäger* was affected by the fact that they were not supplied with sufficient high-explosive ammunition; this cannot be explained, since the 3.7cm SprGr was readily available.

The lack of an infantry element within the PzJgAbt, for defence against attacking infantry but capable of launching a counterattack, was deemed to be unfortunate. The Panzerbüchse (PzB) 38 anti-tank rifle was not used to any extent during the assault on Poland, as only 66 had been delivered to the army by 1 September 1939.

France

5

After the conclusion of the Polish campaign Hitler decided to turn his attention on his next objective – France.

Following the German invasion of Poland, both France and Great Britain declared war on Germany on 3 September 1939, but did not commit any military assets to support Polish forces and halt the advance of the *Wehrmacht*. It would have spelled disaster for Hitler if Great Britain and France had launched a determined assault on the western borders of Germany

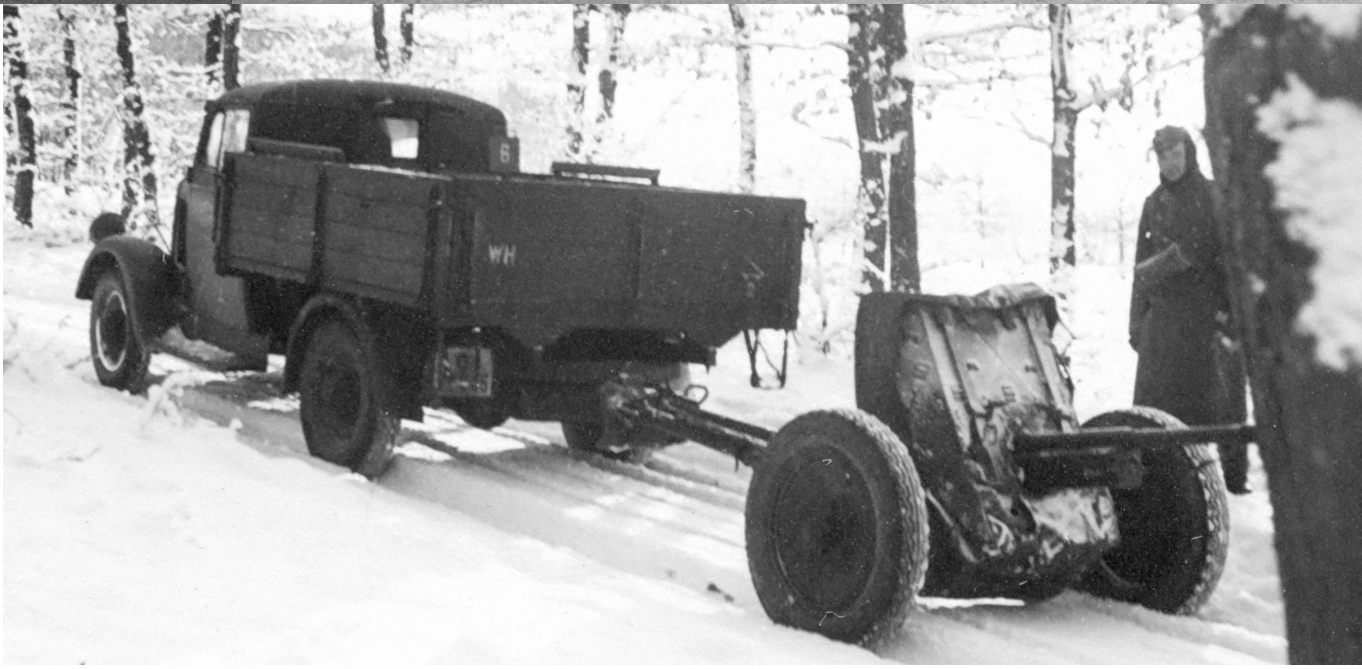
Indeed, the attack on Poland was just one of the options available to Hitler, who had previously confided to his closest cohorts that France was his true target. However, the German general staff persuaded him that an attack on France would have led to a major war in central Europe, which would ultimately involve Great Britain; Germany was not prepared for such a conflict. From September 1939, the period known as '*drôle de guerre*' (phoney war) lasted until 10 May 1940, when German forces launched their *Blitzkrieg* on the Low Countries.

In early 1940, four *leichte* (light) divisions were converted to regular Panzer divisions (PzDiv), as part of a long-term plan. Two former army group formations, PzRgt 25 and the PzRgt 10 were attached 7.PzDiv and 10.PzDiv respectively.

The build-up of the *Panzerwaffe* had begun, resulting in an increase in the number of tanks armed with the 3.7cm or 7.5cm gun in the Panzer divisions:

PzKpfw 35(t): from 164 to 118
PzKpfw 38(t): from 57 to 207
PzKpfw III: from 87 to 349
PzKpfw IV: from 197 to 280

A 3.7cm PaK is being ferried over the Maas (Meuse) to reinforce German forces occupying Fort Eben-Emael. The *Floßsack* (rubber dinghy) is barely large enough to carry the gun and crew members.



A 3.7cm PaK towed by an Opel 1.5-ton light truck during the *drole de guerre* (phoney war) over the winter 1939/40. The vehicle carries civilian licence plates, but WH has been stencilled on the rear to indicate that it is in military service. On the right-hand side of the tailgate is the tactical sign for the second company of a divisional tank destroyer battalion.

With full knowledge of the efforts being made by the French to introduce better armed and armoured tanks, the *Organisationsabteilung* demanded similar efforts to be made in 1938. As a direct consequence, the rearming of the PzKpfw III with the 5cm KwK L/42 gun had been decided, but limited manufacturing capacity and a weak German economy held back any thoughts of a rapid implementation.

At the same time as the tank improvement programme began, the assembly of a dedicated anti-tank defence force became more urgent, as did the search for a self-propelled anti-tank gun.

The 3.7cm PaK

On 10 May 1940, more than 100 infantry and ten tank divisions were deployed to invade the Low Countries and then France. At that time the 3.7cm *Panzerabwehrkanone* (PaK – anti-tank gun) was the standard and most numerous anti-tank gun.

During the invasion of Poland, combat against soft or semi-hardened targets was made extremely difficult because high-explosive ammunition was not available. This cannot be explained, since the Sprengranate 18 was readily available, but the lack of a high-explosive round was the subject in some after-action reports.

In a letter, dated 8 November 1939, the *Oberkommando des Heeres* (OKH - high command of the army) ordered:

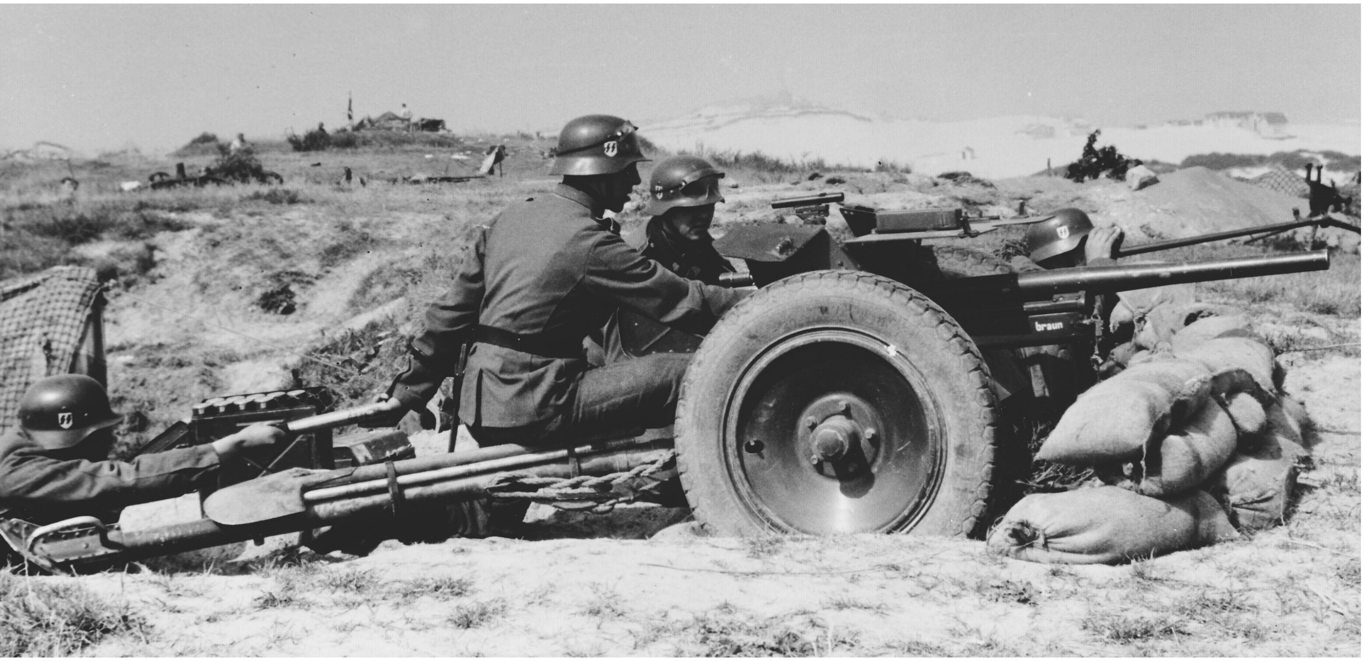
> For 3.7cm PaK, a Sprengranate ammunition will be issued soon, but not before December. In the meantime, and until all units have sufficient stocks, the *Panzergranate* armour-piercing round can be fired.

When the Sprengranate 18 rounds became available, the range of applications for the 3.7cm PaK was considerably increased.

A total of 883 ex-Czech army 3.7cm PaK 37(t) were divided up between a number of infantry divisions; the exact allocations are unknown. The vast majority of 4.7cm Böhler guns commandeered from the Austrian army were allocated for use in fortresses.

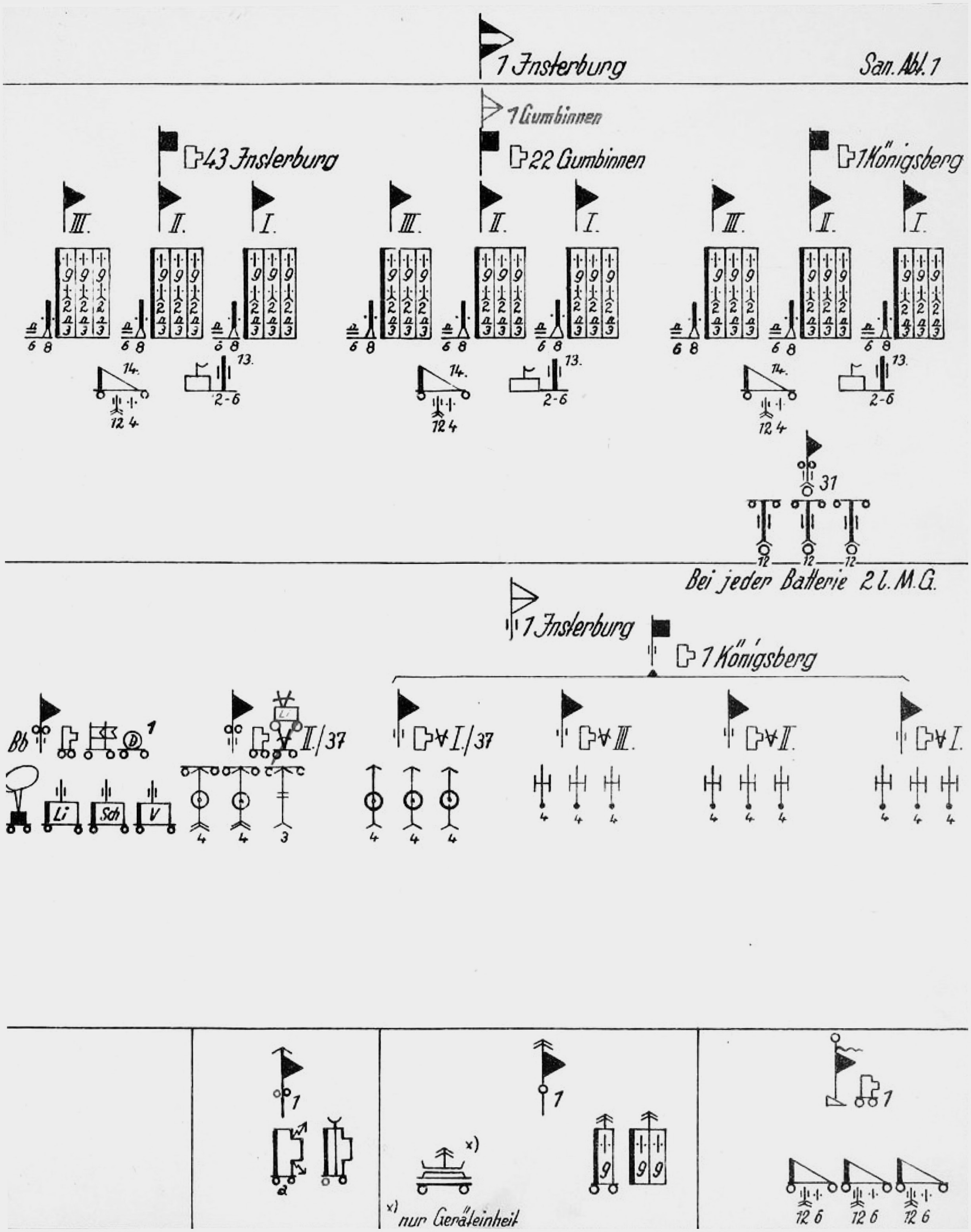
1940 – Organizational Issues

In April 1940 new orders of battle were published, detailing every unit in the army along with their integrated and attached subunits. The structures remained valid until a revised version was published. But on many occasions they were – with some regularity – altered by hand: The result; a very complicated situation. The handwritten remarks are often difficult to decipher, so that a great degree of uncertainty remains. However, the structures do allow one to gain a broader view; in this case, the complete organization of the *Panzerjägertruppen*.



The 3.7cm PaK has been dug-in and protected by a wall of sand bags. Although easy to conceal, the crew have taken the precaution of folding down the gun shield to minimize the height of the gun. A member of the crew, lying prone, passes an ammunition round to the loader.

The allotment of anti-tank elements to infantry divisions: 1.InfDiv in September 1939.


1 Insterburg
San. Abt. 1
1 Gumbinnen
43 Insterburg
22 Gumbinnen
1 Königsberg
III.
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9
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14.
13.
12 4
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Bei jeder Batterie 2 l. M.G.
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1 Königsberg
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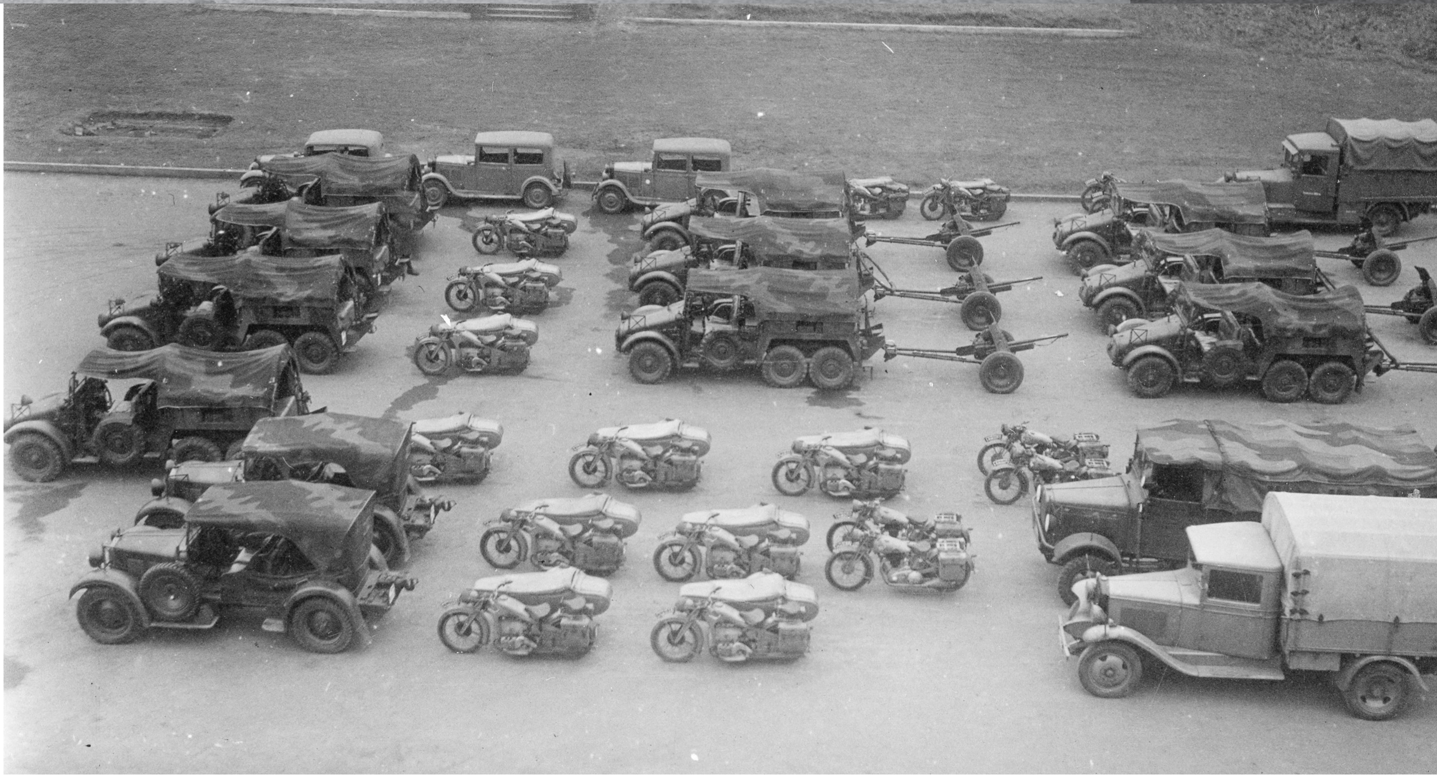


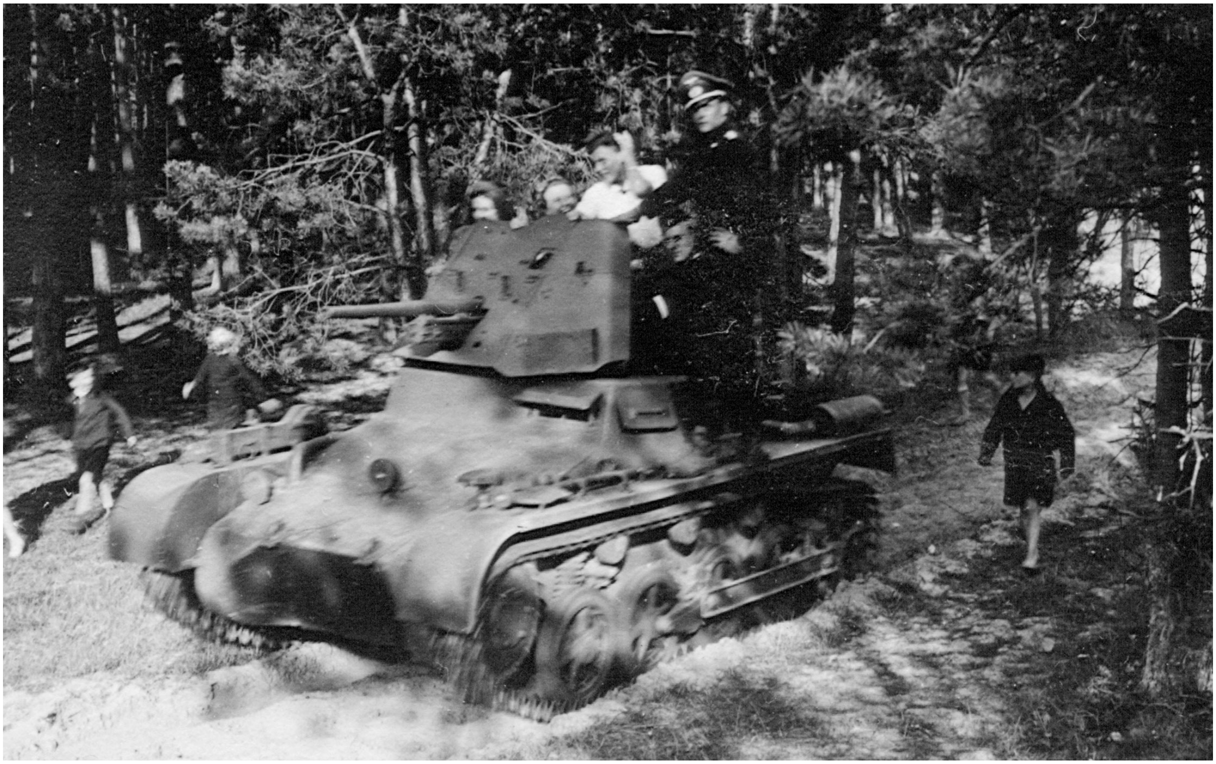
Elements of a PzJg-Abt, possibly of 251.InfDiv, assembled on a parade ground. The combat echelon in the company is equipped with the *Protzkraftwagen*, while the remainder has a few light field cars, several civilian passenger cars and also a civilian and military truck.

Infantry Divisions

The organizational structure for the infantry divisions, and also the light and mountain divisions was not uniform. The proposed target followed a three-way approach.

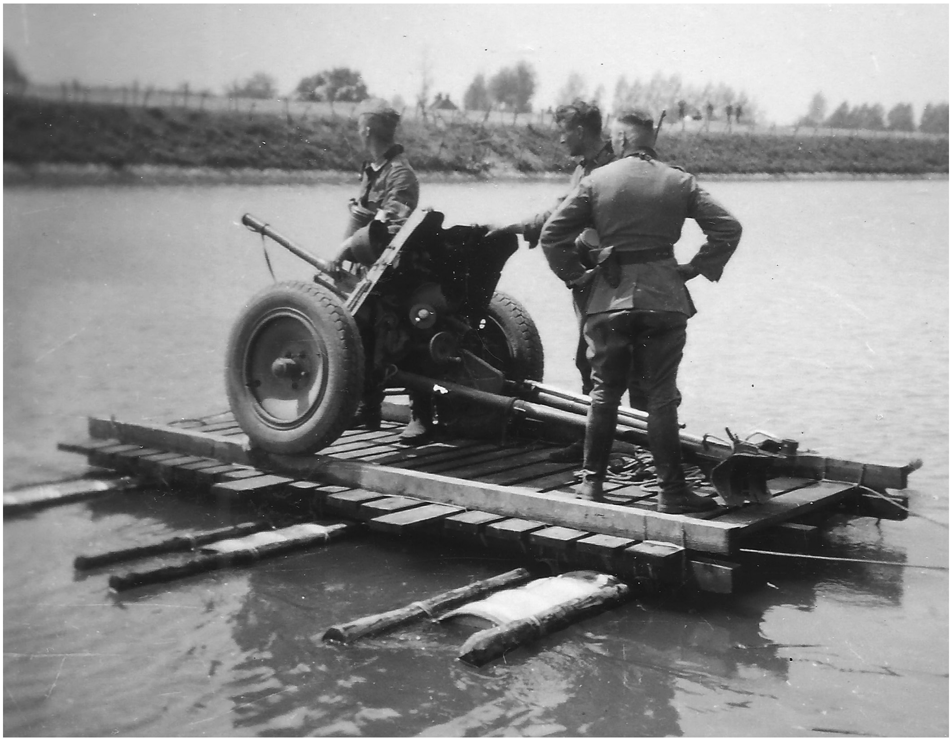
- Each of the three infantry regiments was to be provided with a *Panzerjäger-Kompanie* (14.Kp) – according to KStN 1141 dated 1 October 1937 – authorized to have twelve 3.7cm PaK, officially implementing the decision to increase the number of anti-tank guns.
- The *Aufklärungs-Abteilung* (reconnaissance battalion) was authorized to have one *Panzerjäger-Zug* (anti-tank platoon), equipped with three 3.7cm PaK (KStN 1122 dated 1 October 1937).
- The divisional *Panzerjäger-Abteilung* (PzJgAbt - tank-destroyer battalion) had three companies each equipped with twelve 3.7cm PaK, (KStN 1141 dated 1 October 1937).

Apparently it was not possible to equip all divisions to these structures. The most probable reason was the shortage of towing vehicles. Also a detailed listing of all units would too time consuming. For instance, 11.InfDiv was shown to have a planned full establishment, while 3.InfDiv had only two companies in the PzJgAbt, and no anti-tank guns in the reconnaissance



Above: This is possibly a conversion carried out at troop level, before the war, to improve the mobility of the 3.7cm PaK; the light anti-tank gun has simply been mounted on a PzKpfw I Ausf A.

Right: The crew of a 3.7cm PaK has assembled a simple raft from fencing, wooden planks and empty oil drums to ferry their gun across a wide river; possibly the Maas (Meuse).



The crew – two are wearing harness – haul their 3.7cm PaK along a dry, hard-surfaced road to a new position on the battlefront; a difficult proposition in thick mud. After the French campaign, a number of guns were fitted with a rear castor wheel to improve manoeuvrability. (Getty)

battalion. A full establishment was provided for 4.InfDiv, but also lacked one company in its PzJgAbt. This inconsistency was carried through all of the infantry divisions.

Tank Divisions

In 1940 it was planned to issue equipment in a similar way to the infantry divisions, but the tank divisions had a non-standard establishment with anti-tank gun subunits: an organizational structure did not appear to exist.

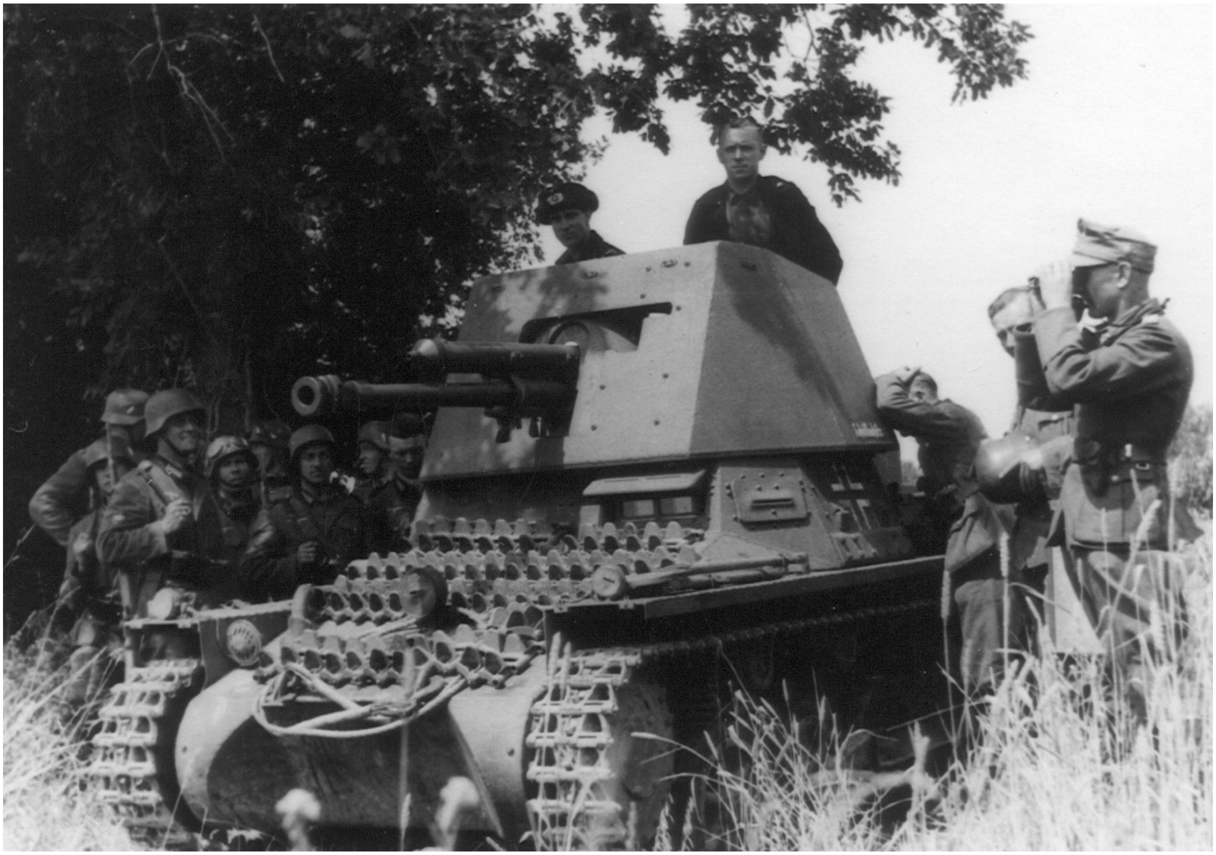
- The *Aufklärungs-Abteilung* appeared to conform, being provided with one *Panzerjäger-Zug* (anti-tank platoon) equipped with three 3.7cm PaK (KStN 1122 dated 1 October 1937).
- The *Schützen-Brigade* formed of three or four battalions had three 3.7cm PaK in each battalion (KStN 1122 dated 1.10.1937). A noteworthy exception was 10.PzDiv, which had twelve in each battalion.
- The divisional PzJgAbt, were issued with two companies; each with twelve 3.7cm PaK, (KStN 1141 dated 1.10.1937).

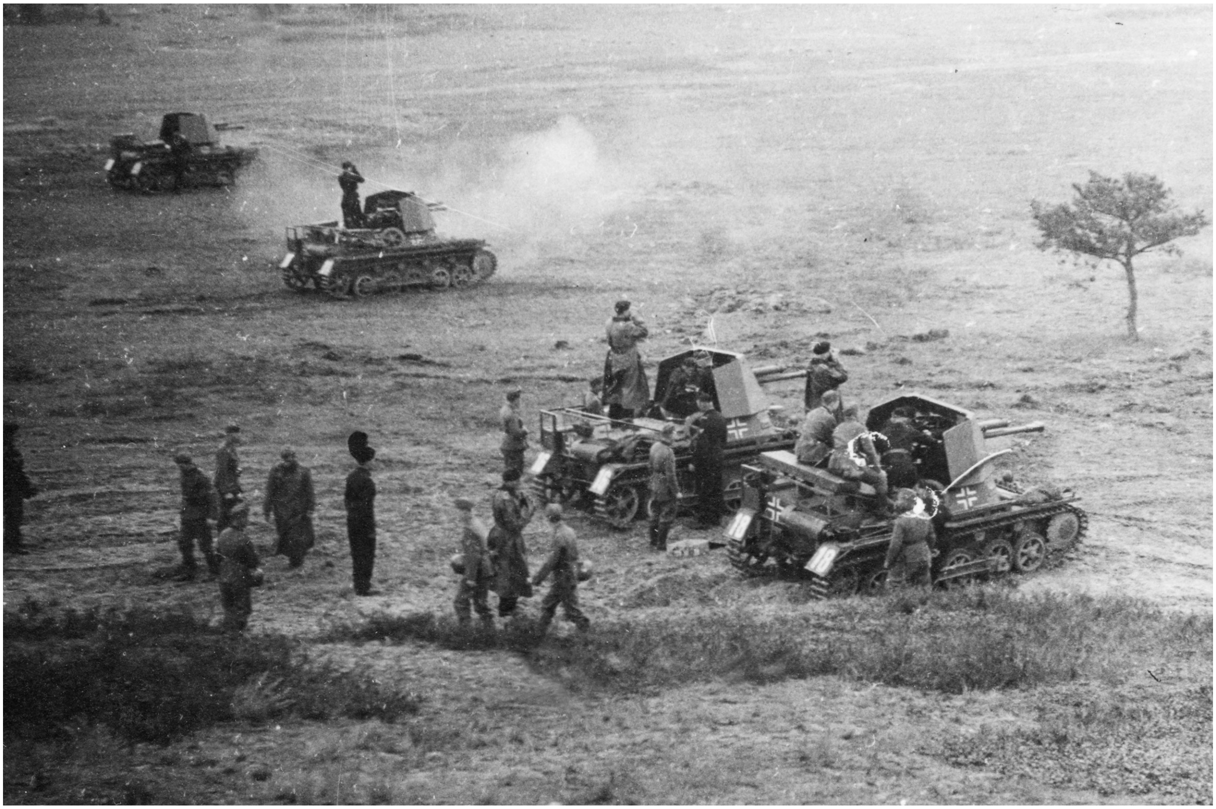
In March 1940, shortly before the *Blitzkrieg* (Lightning War) to the west, the Chief of Ordnance ordered:

> The following: 9.Div, 27.Div and 46.Div will transfer one PzJgKp from their PzJgAbt present strength to form entire units for 1.PzDiv, 2.PzDiv and 10.PzDiv. As follows:
>
> PzAbwAbt 52 of 46.Div to PzAbwAbt 38 of 2.PzDiv
> PzAbwAbt 27 of 27.Div to PzAbwAbt 38 of 1.PzDiv
> PzAbwAbt 9 of 9.Div to PzAbwLehrAbt of 10.PzDiv
>
> Only companies equipped with Protzekraftwagen should be considered for the transfer.

This ruling proves that the offensive elements of the tank divisions selected for the coming invasion of France were most important and were supplied, where possible and feasible, with additional equipment. It also shows that the Krupp-

When the *Blitzkrieg* on France was launched, the attacking forces were supported by a limited number of self-propelled guns mounting the powerful Czech-built 4.7cm PaK(t). The type was later designated as the *Panzerjäger* I, which proved to be a most effective mobile anti-tank gun. The crew of this vehicle from PzJgAbt 670 has laid spare track links on the front to improve protection, but the additional weight would overload the vehicle's already delicate transmission.





Four *Panzerjäger* I on the live-firing ranges; possibly this was during an exercise in preparation for the invasion of France. The conversion from PzKpfw I Ausf B to *Selbstfahrlafette* (Sfl – self-propelled [SP] carriage) was very straightforward, but the small superstructure provided limited protection for the crew against infantry fire.

built Protzkraftwagen had been supplied to units other than the PzJgAbt of a Panzer division. Again no strict application of the rules is apparent.

However, it should be clear that the stated strengths are conjectural and were rarely met. The supply of towing vehicles, especially for the infantry divisions, was a constant problem. Also there were serious production shortages with almost every type of military equipment. Losses due to enemy action continued to mount and a lack of spare parts delayed the repair of mechanical breakdowns. The result: a significant decrease in operational readiness on the battlefront.

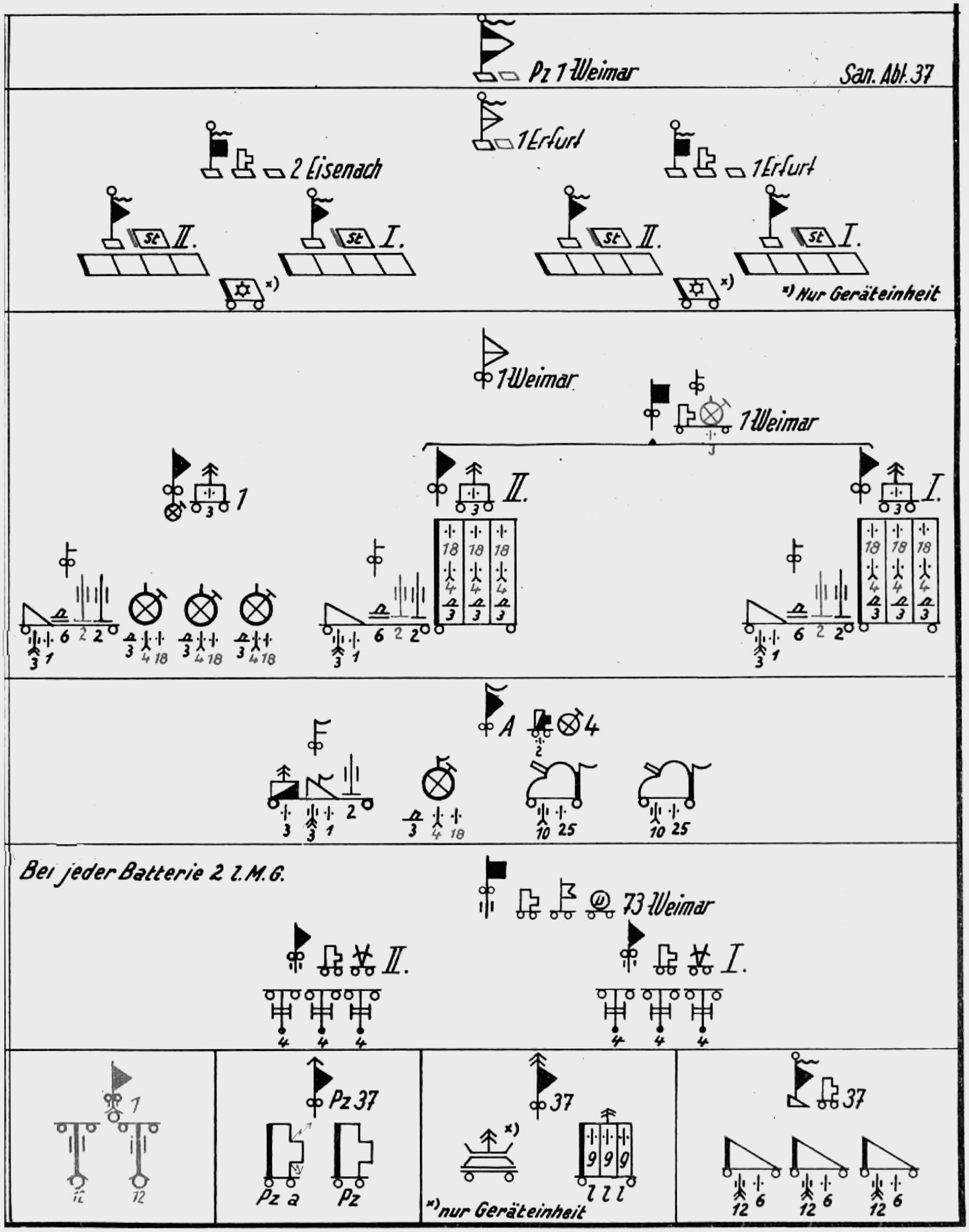
Reinforcing the *Panzerjägertruppen*

Already before the launch of *Fall Gelb* (Plan Yellow), the invasion of France, the *Organisationsabteilung* decided to add specialist tank destroyer units at army troop level as *Heerestruppen*. These forces would be put into action at points of main efforts or to reinforce battle-weary units in the field.

Three sections are identifiable:

The five-man crew of a 3.7cm PaK is ready to open fire on enemy armour advancing across the open landscape, but attacking a French tank at a range of more than 300m was futile. (Getty)

The allotment of anti-tank elements to tank divisions: 1.PzDiv in September 1939.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Bei jeder Batterie 2 l.M.G.
73 Weimar
II.
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37
*) nur Geräteinheit
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12 6

- A number of standard PzJgAbt with three companies each with twelve 3.7cm PaK were established in late 1939. These units (543, 561, 559, 563 and 611) were not attached to regular divisions, but remained at army troop level. PzJgAbt 559 would be issued with the *Jagdpanther* tank destroyer 1944.
- Four further PzJgAbt were established in 1 April 1940 as standard tank destroyer units. These were soon earmarked for being equipped with the first *Panzerjäger-Selbstfahrlafette* (PzJg-Sfl – self-propelled [SP] anti-tank gun), mounting the 4.7cm PaK(t) auf PzKpfw I.
- I./PzJgAbt 8 (with a reduced allotment of six 8.8cm FlaK auf 12t ZgKw) again saw action. Also another three PzAbwAbt, (525, 560 and 605) were re-established as special duty formations equipped with a modified 8.8cm FlaK towed by a semi-armoured SdKfz 7 tractor (see chapter 2). These units were intended to attack heavily armoured border fortifications and defeat any French heavy tanks encountered during the battle.

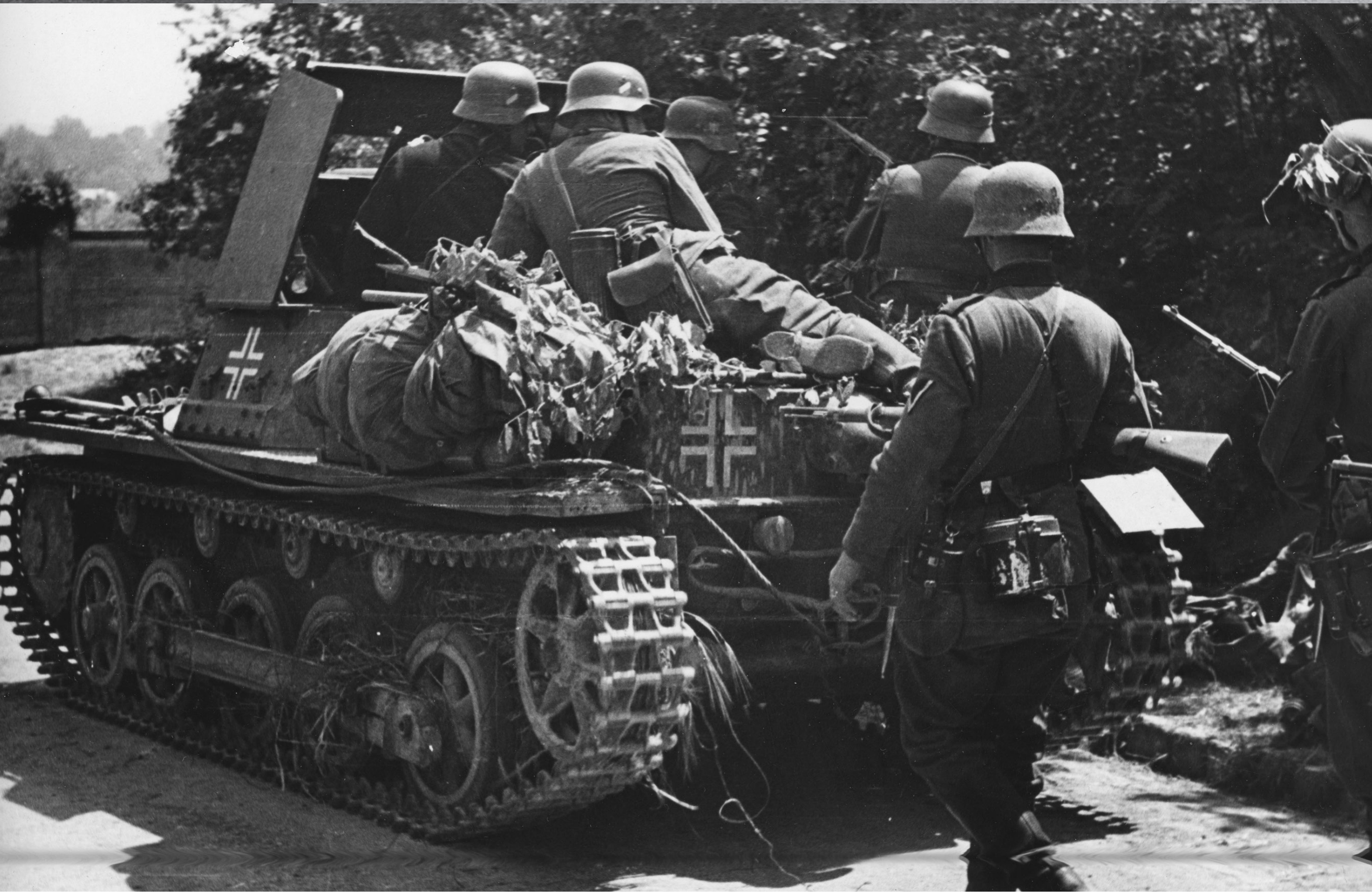
4.7cm PaK(t) auf PzKpfw I

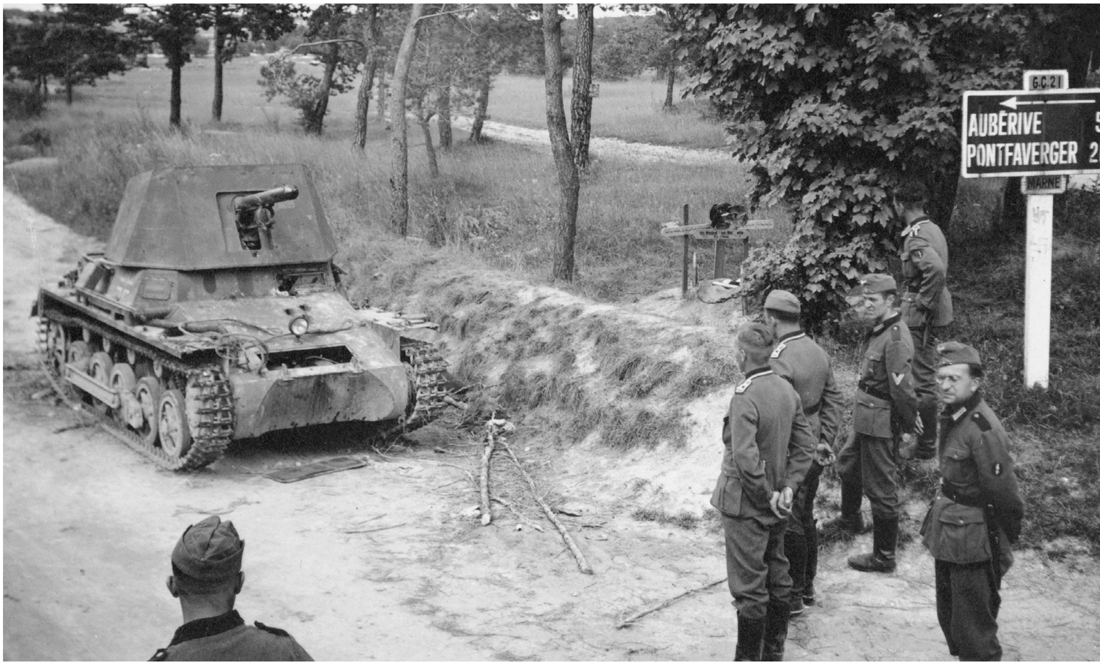
As 1939 turned into 1940, armoured vehicle manufacturer Altmärkische Kettenfabrik (Alkett), which had some spare production capacity, was contracted to design and produce a self-propelled (SP) tank destroyer with some urgency. As the company responsible for the *Sturmgeschütz*, Alkett had provided the solution. The decision to develop and produce a SP tank destroyer solved two urgent problems at once.

- The O*rganisationsabteilung* had been calling for highly-mobile weapons to be supplied to the *Panzerjägertruppen* since 1935/36.
- The gun specified was the 4.7cm PaK(t) which had superior firepower when compared to the 3.7cm PaK. Also it was concluded that the Czech-built gun was the only weapon able to defeat French heavy tanks.

A PaK *auf Selbstfahrlafette* (self-propelled anti-tank gun) would provide improved mobility over rough terrain and be brought to readiness much quicker. But the crew had only limited protection against shell splinters and small arms fire.

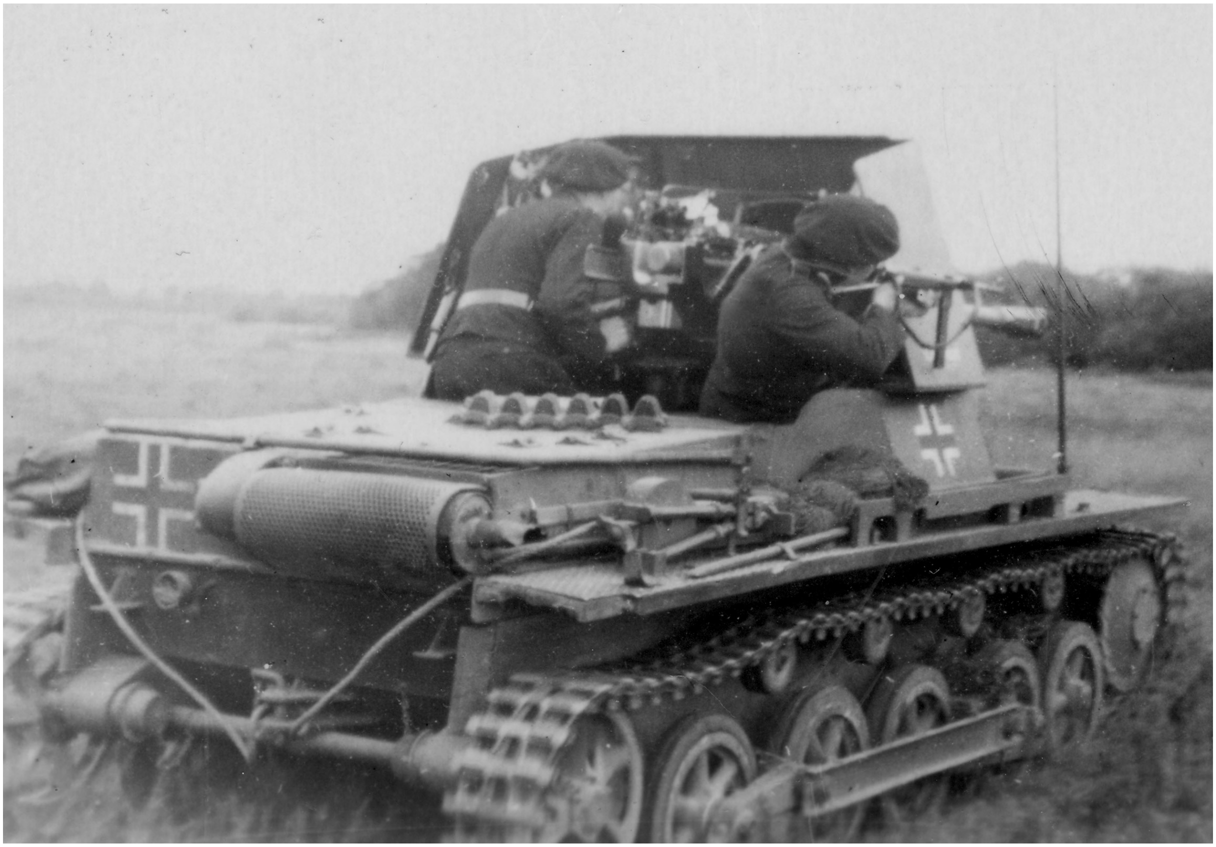
In February 1940, the first vehicle had been completed and after basic trials it would enter production a few months later. By using the chassis of





Above: The 4.7cm PaK(t) gun mounted on the *Panzerjäger* I proved to be more than adequate to defeat most French tanks, but the thin amour of the superstructure could be penetrated by fire from infantry weapons.

Right: A *Panzerjager* I has been immobilized by fire from a French anti-tank gun during the advance on Reims. The three-man crew was killed and their graves are under the trees.



The crew of a *Panzerjäger* I at action stations behind the small armoured superstructure. The commander on the left-hand side operated the gun, while the loader also had to guard against advancing infantry with a *Maschinenpistole* (MP – submachine gun) 40.

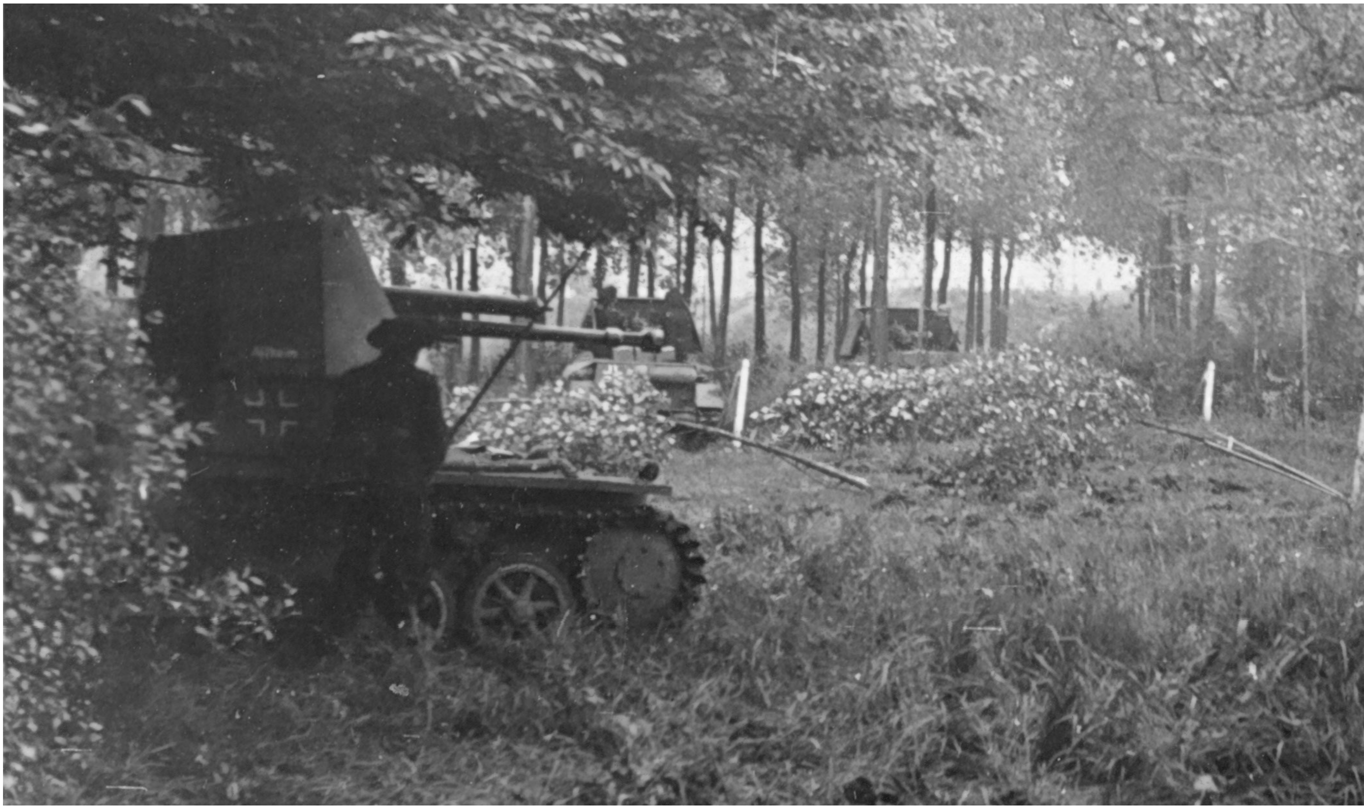
the PzKpfw I the conversion was a very simple process. After removing the turret and parts of the interior, the turret ring was removed and area slightly enlarged. A base plate to carry the gun was welded over the front roof with supporting struts welded to the rear and floor of the chassis. A five-part *Schutzschild* (protective shield) was mounted around the gun assembly.

During production the designation was repeatedly changed:

- 4.7cm PaK(t) (Sfl) auf PzKfw I
- *Panzerjäger* 4.7cm PaK (Sfl), and finally
- *Panzerjäger* I

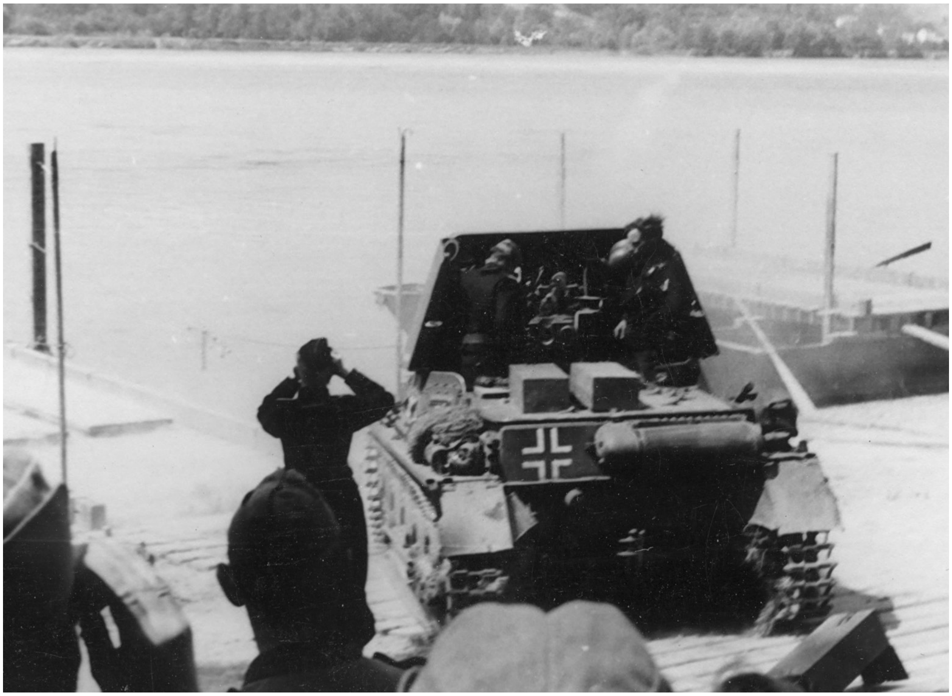
As noted in the *Überblick über den Rüststand* survey dated February 1940, initially only one series of 132 of the type were to be built between March and May 1940, using obsolete PzKpfw I chassis.

For current PzJgAbt re-equipment would start on 1 May 1940. PzJgAbt 521 was authorized 18 self-propelled guns (three companies with six each), the other three had a total of 27 (three companies with nine each).

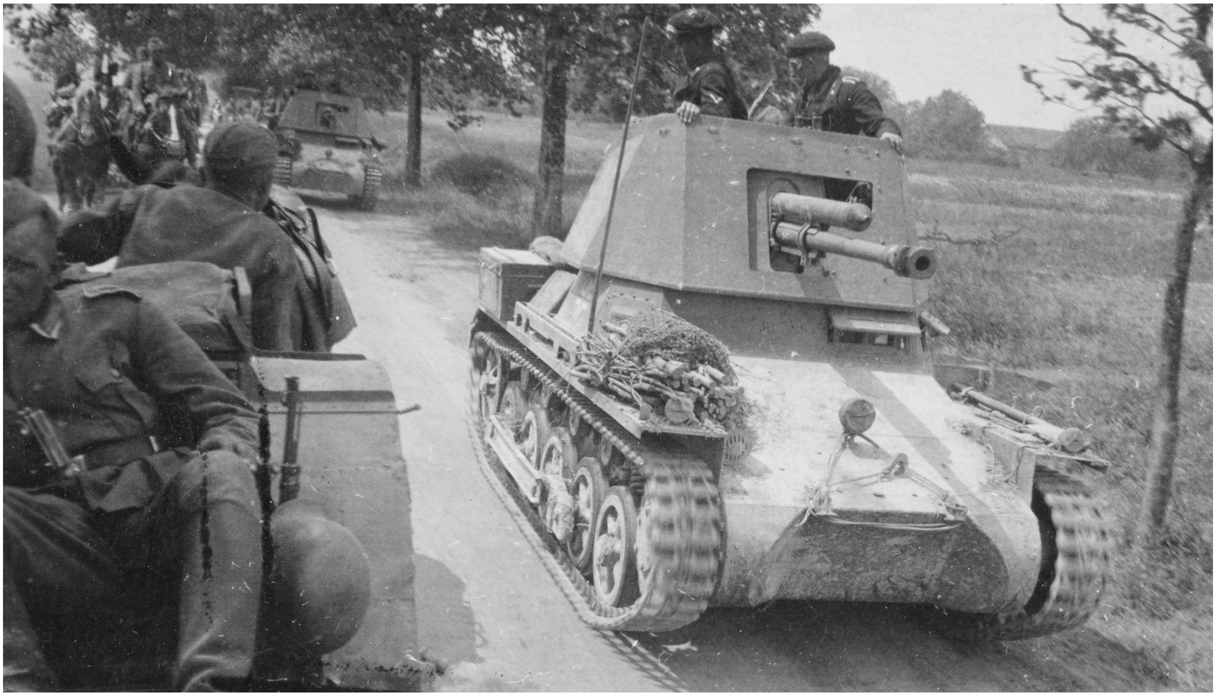


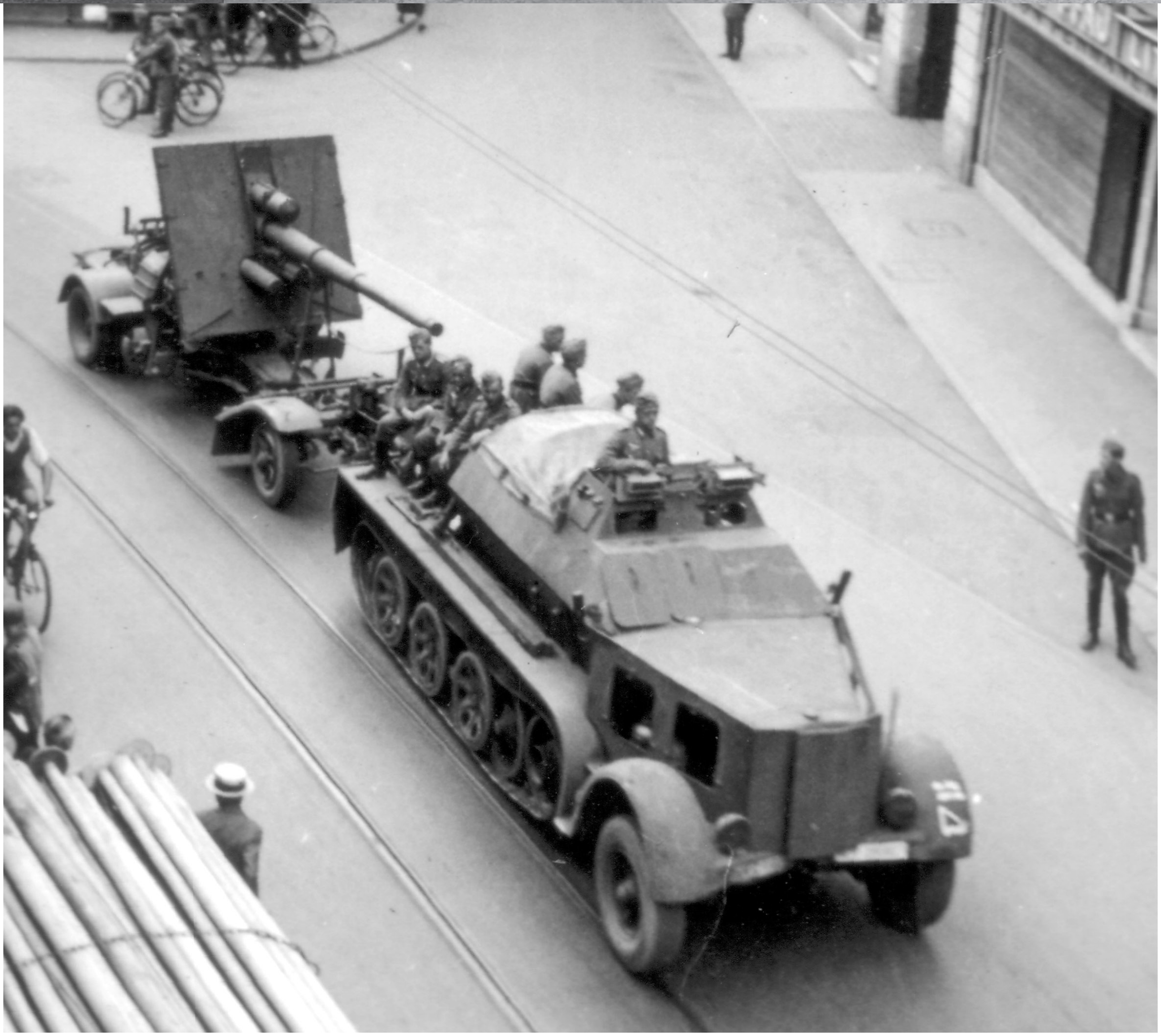
Above: Elements of PzJgAbt 670 concealed in woodland awaiting further orders. Although *Panzerjäger* I was far from perfect, it did provide the anti-tank force what it had previously lacked – mobility.

Right: A *Panzerjäger* I positioned on a river bank provides fire support to units making the crossing. Although classified as a medium PaK, the 4.7cm PaK(t) fired very effective high-explosive ammunition.



Below: A *Panzerjäger* I motors past a column of horse-drawn artillery, an indication of the discrepancy in the type of equipment used by the German army. Despite the fact that the PzKpfw I Ausf B chassis was overburdened, the concept proved to be promising, and it would take another two years before better-armed self-propelled guns entered service.





An 8.8cm *Bunkerknacker*: The open-topped crew compartment is covered with a tarpaulin and the crew is sitting on the armoured ammunition boxes. Side panels in the bonnet have been removed to improve engine cooling and are stowed on the slope in front of the driver's position.

For the sake of completeness it should be noted that a similar type was built using the PzKpfw I Ausf A chassis, and mounted a 3.7cm PaK fitted with a slightly modified gun shield.

BunkerFlak (BuFlak)

Before the war various units made numerous requests for a supply of heavy calibre guns for supporting the infantry against enemy armour or for attacking hardened positions. The decision to equip divisional artillery with only howitzers aggravated the problem. Due to the absence of 7.5cm field guns, in the months running up to the war, it was decided to use the 8.8cm FlaK 18. In Poland, the only unit equipped with the gun to see action was 1./PzJgAbt 8 (1.Kp, PzJgAbt 8) which had a complement of ten FlaK 18 mounted on SdKfz 8 (12t ZgKw) and operated as *Schartenbrecher* (bunker buster).

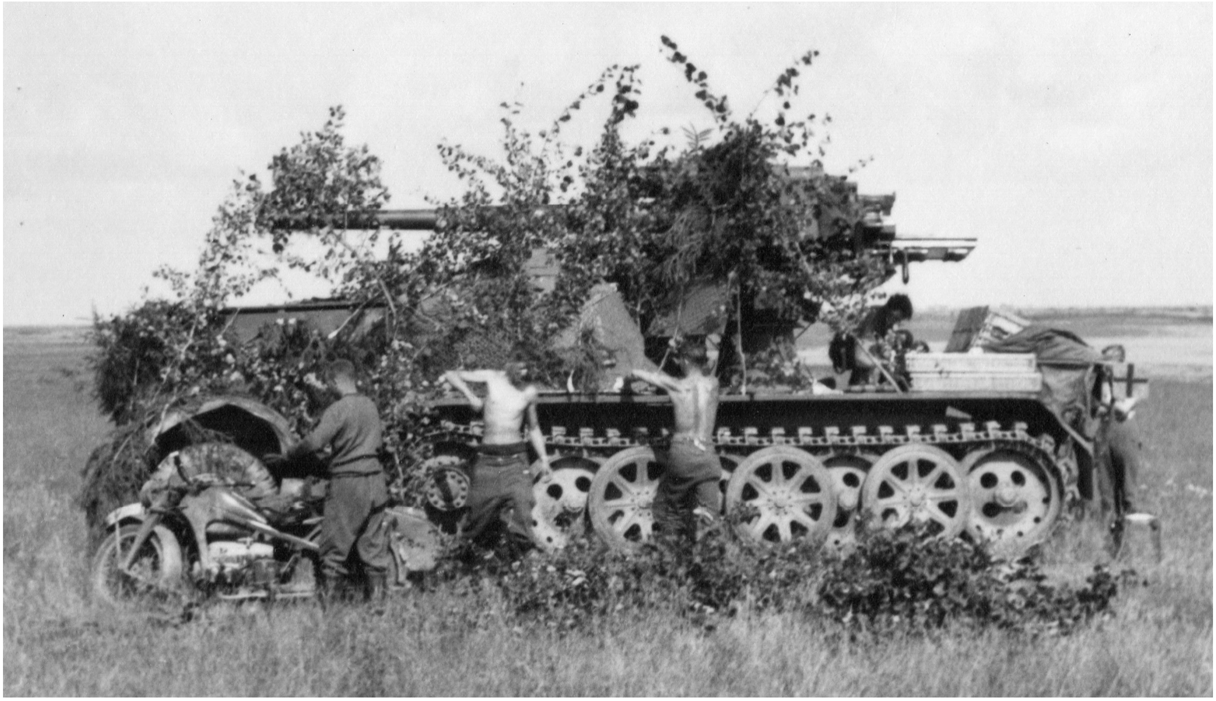
When this unit was deployed for the invasion of France, it had been reduced to six guns and was chiefly assigned to the 1.PzDiv and 2.PzDiv.

In 1939, a total of 33 had been converted as a towed gun for use against difficult-to-defeat hardened positions and also armour. All were issued to PzAbwAbt 525, 560 and 605 which had been established in August 1939 as ordinary tank destroyer units. Later, it was ordered by the *Organisationsabteilung* that all should be converted to armoured 8.8cm BuFlaK (*BunkerFlak*) – PzAbwAbt 525 and 560 by 16 October and PzAbwAbt 605 by 3 November. All were deployed on army troop level.

In this context it should be remembered that a great number of *Luftwaffe* 8.8cm FlaK guns were also attached to army units.

5cm PaK 38

The development of a 5cm anti-tank gun was completed in early 1940. However, introduction into service proceeded at a slow pace, and by April only two guns had been delivered, A further 20 had been delivered by the beginning of June.



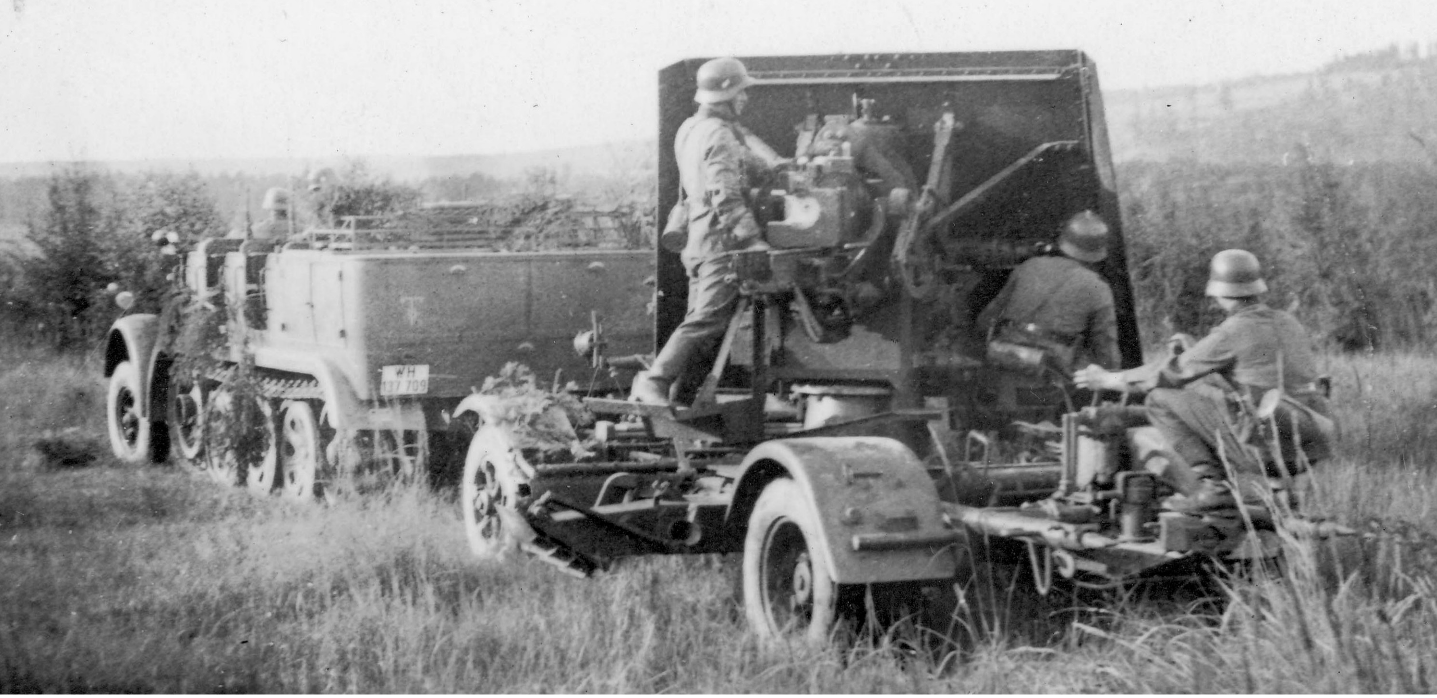
The crew of an 8.8cm *Bunkerknacker* has made an attempt to camouflage the massive vehicle in the open terrain. The motorcycle dispatch rider was vital to the operation of the gun should fuel, ammunition or mechanical assistance be urgently required.

On 17 June 1940, the ordnance department declared that production of the 3.7cm PaK was being affected by the introduction of the 5cm PaK 38. At that time several companies had received orders to manufacture the new gun, when the ordnance department requested a further increase in production of the 3.7cm; but this could not be achieved until October 1940. However, the *Überblick Rüststand des Heeres* (armament statistics) files do not show a significant increase until end of the year. Production of the 5cm PaK 38 began, but was almost immediately dogged by a number of severe problems. Delays to the delivery of the 5cm PaK 38 were overcome by bringing into service weapons commandeered from foreign armies; namely the 4.7cm PaK(t) and 4.7cm PaK(ö).

In March 1940, the OKH ordered the first troop trial:

> Subject: troop trial with 5cm PaK 38
>
> According to KStN and KAN Nr 1444 (temporary) dated 2 March 1940
>
> One company will be established at PzLehrRgt with PaK 38
> and one company of PzAbwKp 20 will be re-equipped with PaK 38.
>
> The PaK 38 will automatically be issued at the beginning of April, after receipt of which PzAbwAbt 20 will send their twelve 3.7cm PaK with ancillaries to the relevant army depot. Furthermore, each company will automatically be issued with six ammunition trailers. The requisition for the PaK 38 will be sent in time. A number of further questions will have to be answered.

This 8.8cm *Bunkerknacker* is towed by an un-armoured SdKfz 7 half-track tractor. The supply of armoured tractors was limited and losses could not be replaced.



The crew of an 8.8cm *BunkerFlak*, which remains on its trailer, prepare to open fire on a distant target; the gun was deadly accurate at ranges over 1,500 to 2,000m. The towing vehicle is a standard SdKfz 7.

The new anti-tank gun was not deployed for the invasion of France. However in early July 1940, an evaluation team from the *Heereswaffenamt* (army ordnance department) was sent to France to perform test firings with a 5cm PaK 38 using captured French Char 2 C heavy tank as targets. It is alleged that the frontal armour on both types was easily penetrated.

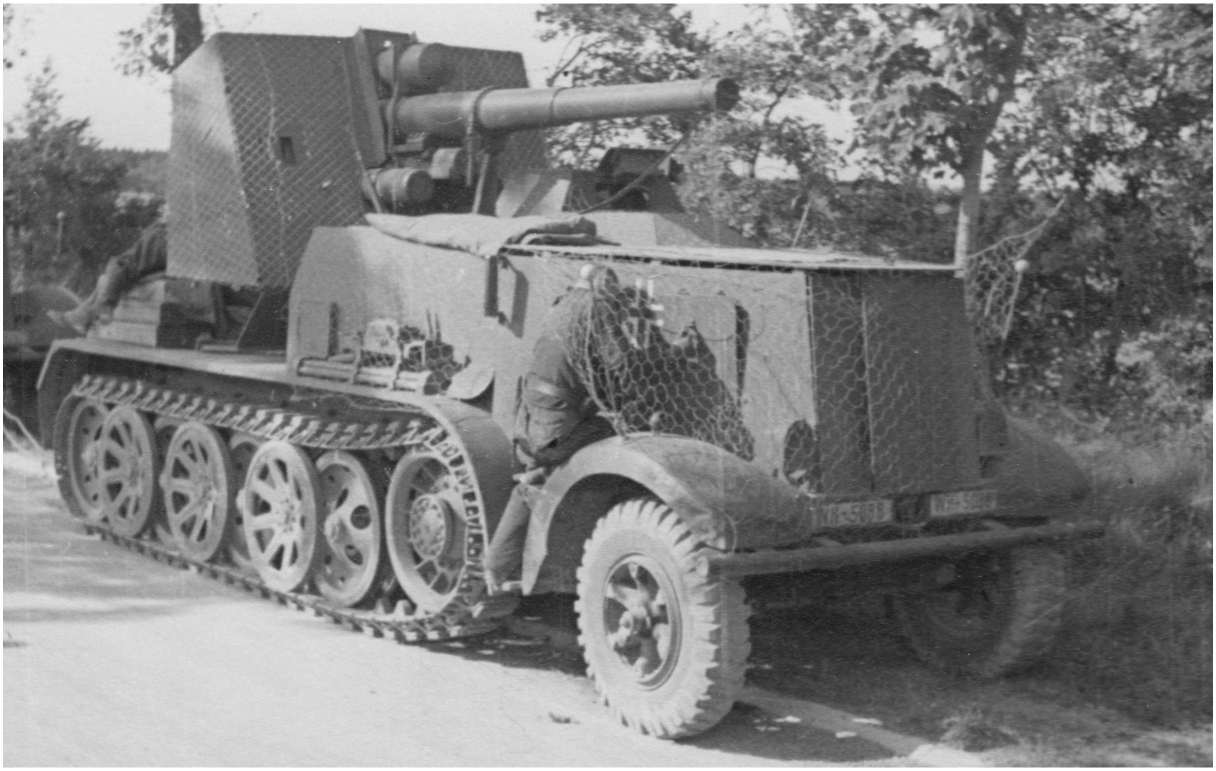
Assessment of *Panzerjäger* Weapons

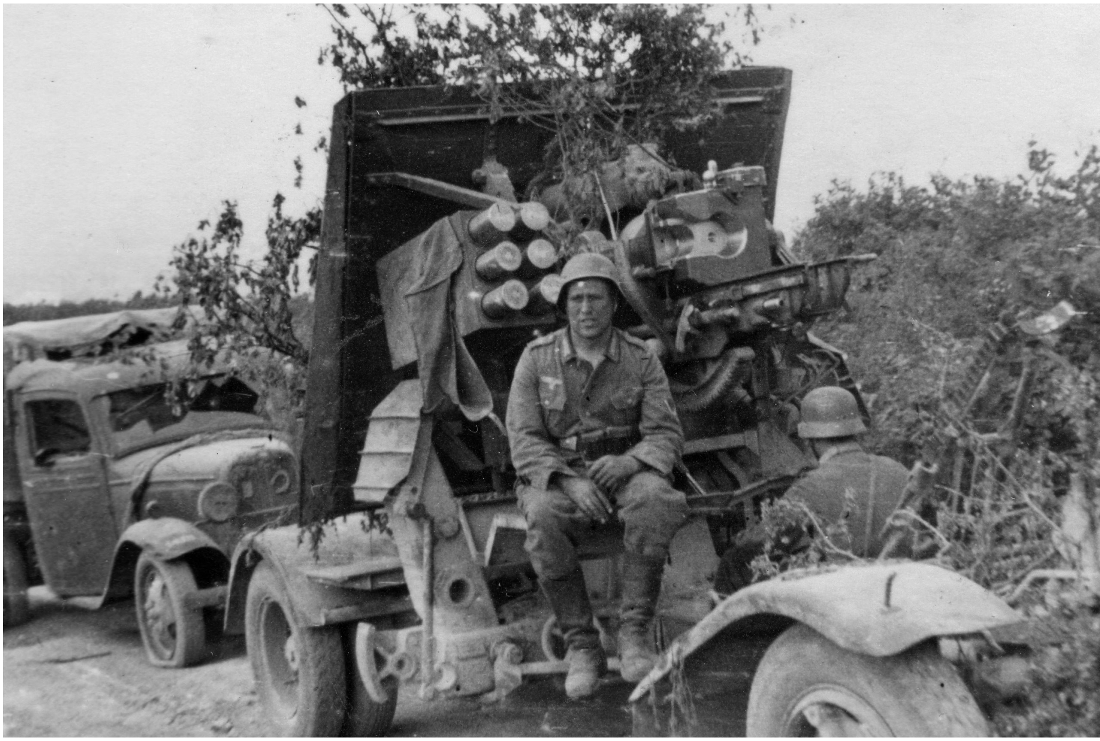
On 2 June 1940, 1.InfDiv performed a live firing exercise at a captured Renault tank. Sadly, the exact type is unknown; however there is a distinct difference between the armour of a Renault FT-17 from World War I and that of the more modern R-35:

> The trial firings at a captured French tank (Renault) resulted in:

Penetration with PaK	at 700m
Penetration with PzB	at 300m
Penetration with SmK (Hartkern)	at 100m

The armour on an R-35 was 32 to 45mm thick, but the above data suggests that an FT-17 was used as the target. One certainty is that a 3.7cm PaK would not have been able to defeat an R-35.





Above: To facilitate the easy addition of foliage to camouflage this *Bunkerknacker* (SdKfz 8), the crew has wrapped chicken wire around the front of the vehicle and also the gun shield.

Right: A six-round ammunition rack was mounted behind the gun shield to the left of the gun breech to allow a short period of rapid fire.

After the campaign, 1.InfDiv reported their ammunition consumption for the period 10 May to 31 July 1940:

3.7cm SprGrPatr of the regimental 14.Kp:	399
3.7cm SprGrPatr of the divisional PzJgAbt:	572
3.7cm PzGrPatr of the regiment 14.Kp:	1,612
3.7cm PzGrPatr of the divisional PzJgAbt:	572

Regarding the armour-piercing rounds, the data confirms that the front-line PaK units consumed three times more than tank destroyers at divisional Level. On 18 December 1940, the OKH published a summary of the combat experiences of the infantry during the French campaign:

> 5) Anti-tank defence
>
> According to troop reports the anti-tank weapons with the infantry have destroyed a great number of enemy tanks. On one occasion the PzJgKp of an infantry regiment had destroyed more than 50 enemy tanks within a short time. Another battalion reported five enemy tanks destroyed by using the Panzerbüchse. However, the reports agree that all tank kills were achieved at close range. For this reason it is necessary to position the weapons far to the front and to instruct them to hold their fire and shoot at the latest opportunity.

The 5cm PaK 38, classified as a medium anti-tank gun, was not ready for action when the attack on The Low Countries and France was launched. However, as the Blitzkrieg progressed a small number of guns were delivered to France for troop trials.

The main anti-tank weapon for the *Panzerjäger* forces was still the 3.7cm PaK. It was known that the gun was just about useless against French armour, but troops found that it was excellent for many other missions including infantry support. (Getty)

The notes above show that a close-combat weapon such as the Panzerbüchse was extremly effective when manned by well-trained soldiers. Furthermore, the infantry was equipped with the 3.7cm PaK, the performance of which they considered too weak. The gun was only effective at very close range and could not be deployed in the conventional way for anti-tank guns. But, the infantry did consider the 3.7cm PaK to be a most effective mobile infantry weapon.

By January 1941, the *Generalstab des Heeres* (general staff of the army) delivered a report evaluating combat experience gained in France, with the addition of a number of requests and other demands. The existence of independent PzJgAbt at Armeekorps or army level was considered confusing. While I.Armeekorps and XIII.Armeekorps (infantry) were in agreement, XXXIII.Armeekorps (infantry) rejected this structure. However, both *Panzerkorps* Kleist and *Panzerkorps* Guderian, and also XXXIX.Armeekorps (tank) deemed it to be necessary. Possibly the units available at army group level were considered to be sufficient.

The Panzerbüchse was designed as a cheap-to-manufacture anti-tank rifle, in service the weapon was rated very differently by the army. Some units demanded delivery of more at a rate of one to two for each infantry platoon, while others wanted to be rid of the gun.

Although the 3.7cm PaK was generally considered to be obsolete with regard to armour penetration, 34.InfDiv and 36.InfDiv demanded to keep

the weapon, but requested that all were mounted on armoured carriers.

The 14.InfDiv, 24.InfDiv and 63.InfDiv conformed to the standard organizational structures, but did not wish to be equipped with 4.7cm PaK self-propelled guns; the *Panzerjäger I*.

Once again 11.InfDiv, 19.Inf Div and 26.InfDiv requested the supply of more powerful anti-tank guns, preferably 4.7cm PaK. Also an integrated 2cm or 2.5cm *Maschinengewehr* (MG – machine gun) section should be provided for further fire support.

The *Organisationsabteilung*, as one recipient of these reports, now had the difficult task of assessing the different proposals.

Immediately after the French campaign, XXII.Armeekorps headquarters (the former *Gruppe* Kleist) delivered a questionnaire to the attached units.

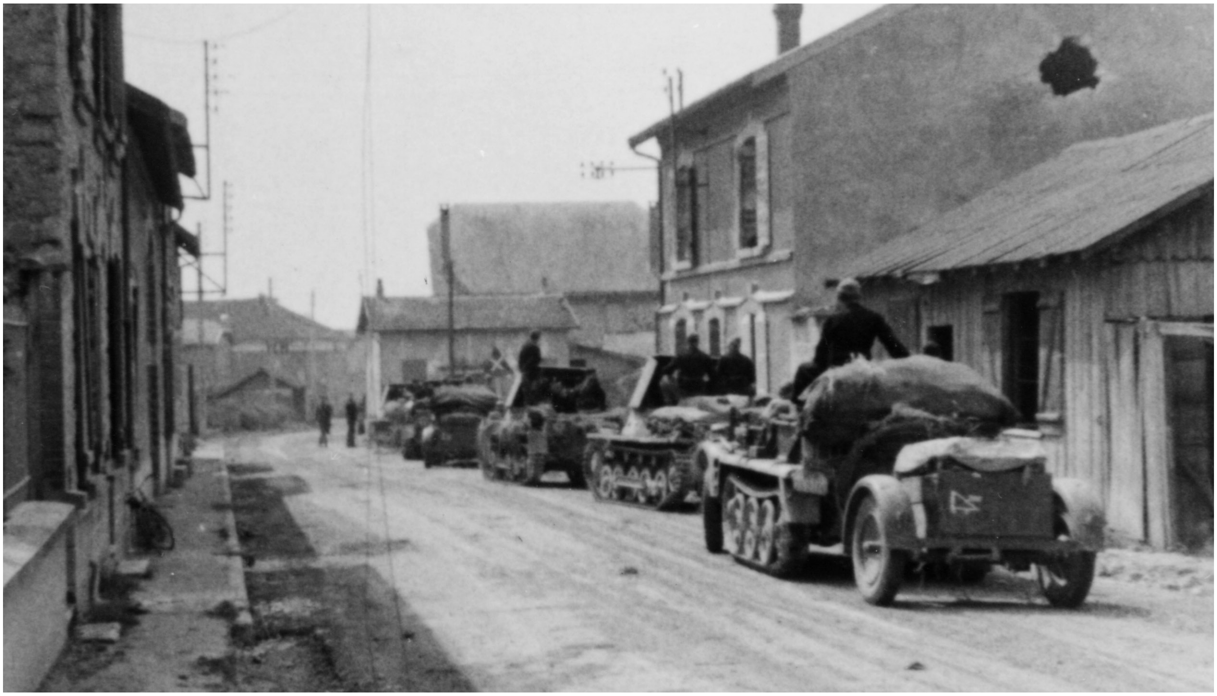
On 15 July 1940, 27.InfDiv sent back their answers in regard to the *Panzerjäger*:

> II. Tactics
>
> 1.) The PzJgAbt was never used in its entirety, since a mass enemy attack using tanks with ambitious objectives never happened.
>
> 3.) [a] The division encountered only small groups of enemy tanks, a maximum of eight to ten (mixed establishment of light and 32t tanks).
>
> [b] Anti-tank defence: Since it was clear that the 3.7cm PaK would only be

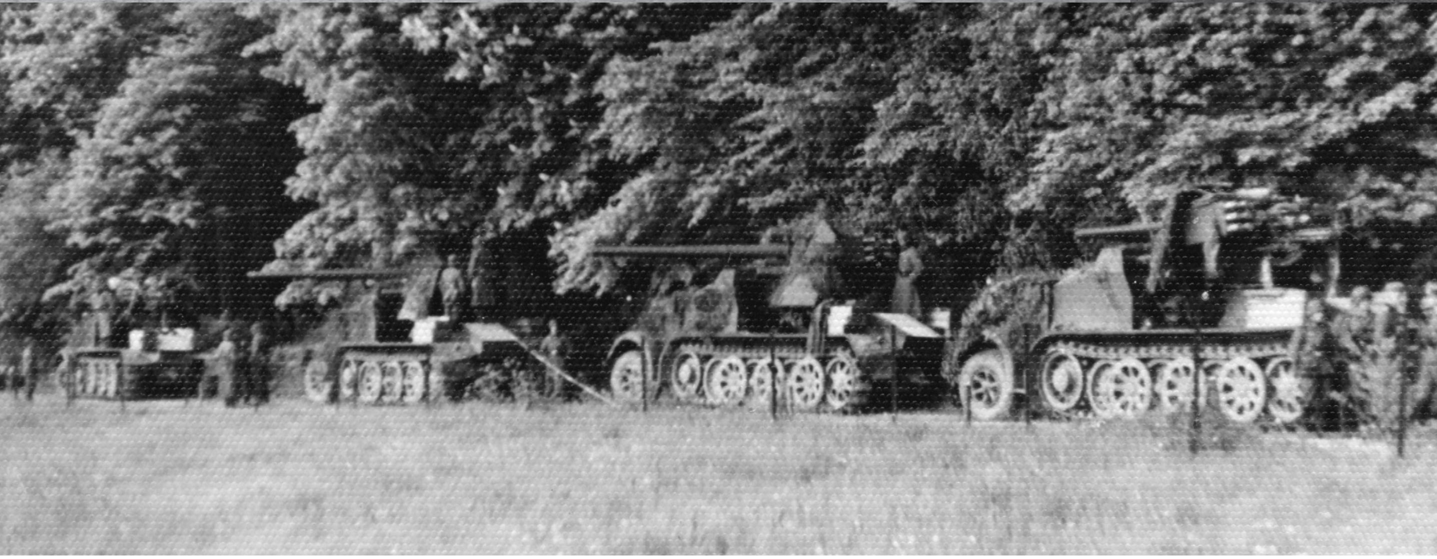
> effective against 32t tanks in few exceptional cases, the infantry was provided with 10.5cm le FH with armour-piercing rounds and 8.8cm FlaK to protect marching columns.

On 14 July 1940, 7.PzDiv delivered their reply to the questionnaire.

> Which weapons proved to be particularly effective, and which weapons did not?
>
> The MG 34, the infantry guns, the heavy grenade launcher and the 10.5cm le FH have proven especially valuable. The 3.7cm PaK has proven to be useless in combat against enemy tanks. On the other hand the gun showed excellent performances firing high-explosive rounds at ground targets.
>
> Did the Panzerbüchse and the SmK ammunition prove to be effective? Will the Panzerbüchse be introduced as special-purpose weapon for the infantry, motorized infantry and pioneers as intended, or will an increased supply of SmK ammunition [for MG 34] be sufficient?
>
> The Panzerbüchse did not prove successful, because the ammunition used did not have sufficient penetration power against certain targets. After the introduction of improved ammunition the troop will appreciate the increased usefulness of the Panzerbüchse. A penetration of enemy tanks at a range of 500m is desired.



A platoon of *Panzerjäger* I, possibly from PzJgAbt 643: an SdKfz 10 half-track carrier towing a SdAnh 32 ammunition trailer is parked in front of four self-propelled guns with another SdKfz 10 and trailer at the rear.



A line of four *Bunkerknacker* from I./PzJgAbt 8 parked on the edge of woodland for cover. Despite their formidable firepower the type had to be used with great caution in combat, as once spotted an enemy would attack with artillery and destroy the vehicle.

> Which enemy weapons had proven to be dangerous for our tanks? Are these weapons superior to our anti-tank guns?
>
> The French 2.5cm and 4.7cm anti-tank guns were regarded as the most effective. As for their penetration power and rate of fire they were superior to our 3.7cm PaK. The French 75mm field gun was considered to be particularly unpleasant. Carefully concealed in a position near a road block the gunners waited and opened fire at 50m range to devastating effect on our tanks and reconnaissance vehicles.

The same questionnaire had been delivered to 10.PzDiv:

> Questionnaire C: Armament and Equipment
>
> Which weapons proved to be remarkably effective, which weapons did not?

Panzer:	The 7.5cm in the Panzer IV
PaK:	4.7cm PaK auf Sfl
Artillery:	MG 34, sGrWrf, 15cm sIG 33
FlaK:	8.8cm FlaK in ground combat 2cm FlaK auf Sfl

> The 3.7cm PaK did not prove effective due to its poor penetration power.
>
> Trials with the 4.7cm PaK auf Sfl and its effect on enemy tanks:
>
> The gun has proved to be very effective against 32t tanks at up to 600m range; light tanks were destroyed at ranges up to 900m. Introduction of tracer

A 3.7cm PaK positioned on a river bank to provide cover for infantry troops crossing the water in inflatable dinghies. The weapon proved to be highly-valued for defeating machine-gun nests and gun positions.

> ammunition is necessary at longer range. Chassis and engine are too weak, and the usage of the PzKpfw II chassis is considered to be necessary. Armour protection at the rear of the superstructure is necessary. More ammunition storage would be appropriate.
>
> Did the Panzerbüchse, and the SmK ammunition prove to be effective. Should the Panzerbüchse be introduced to infantry, motorized infantry and pioneers as special-purpose weapon, as intended; or will the increased supply of SmK ammunition [for MG 34] be sufficient?
>
> The Panzerbüchse should be introduced as intended, since it has better penetration when compared to the machine gun when firing SmK ammunition.

It is not surprising that the headquarters of *Gruppe* Kleist (XXII.ArmeeKorps) demanded in a summary dated 9 August 1940:

Essential requirements:

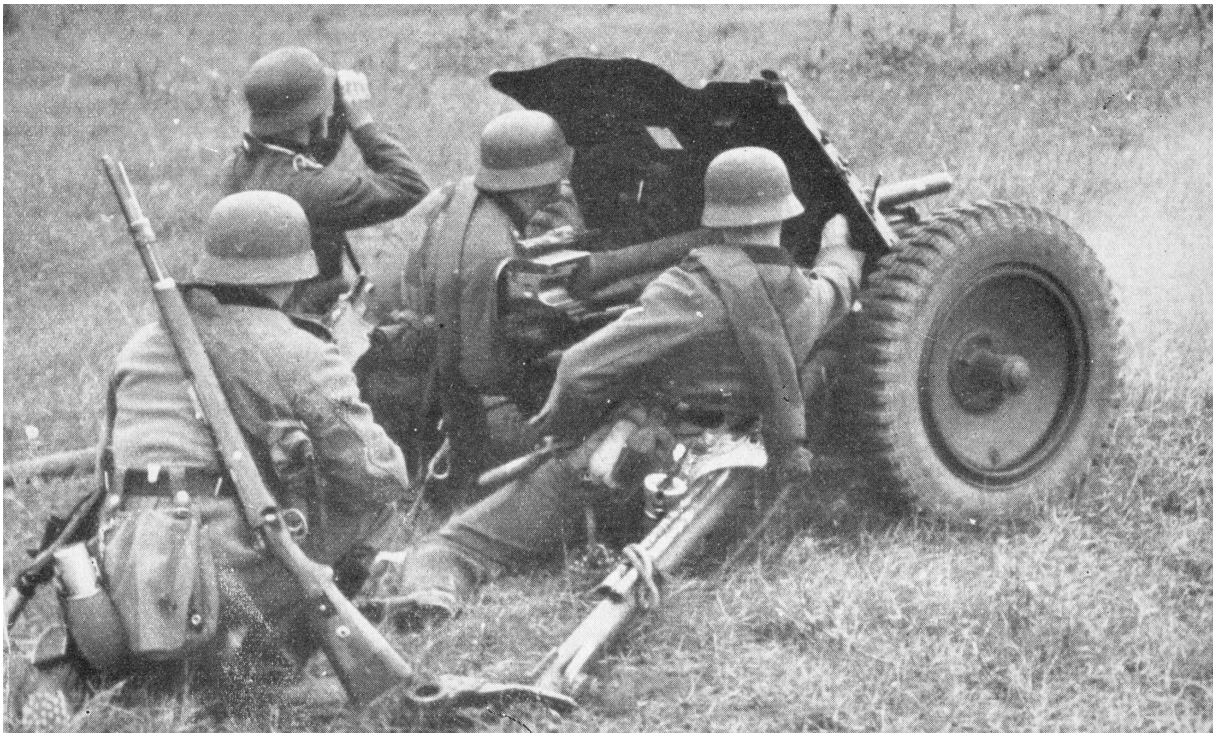
a) Stronger armour protection for our tanks and especially for the reconnaissance cars which is completely inadequate.
b) Better penetration performance from our PaK.
c) Artillery and *Panzerjäger* of the PzDiv should in general be issued with guns on mounted on self-propelled chassis.

A rare after-action report of the deployment of the 4.7cm Böhler anti-tank gun was submitted by verstInfRgt 371 (reinforced infantry regiment) of 161. InfDiv in June 1940.

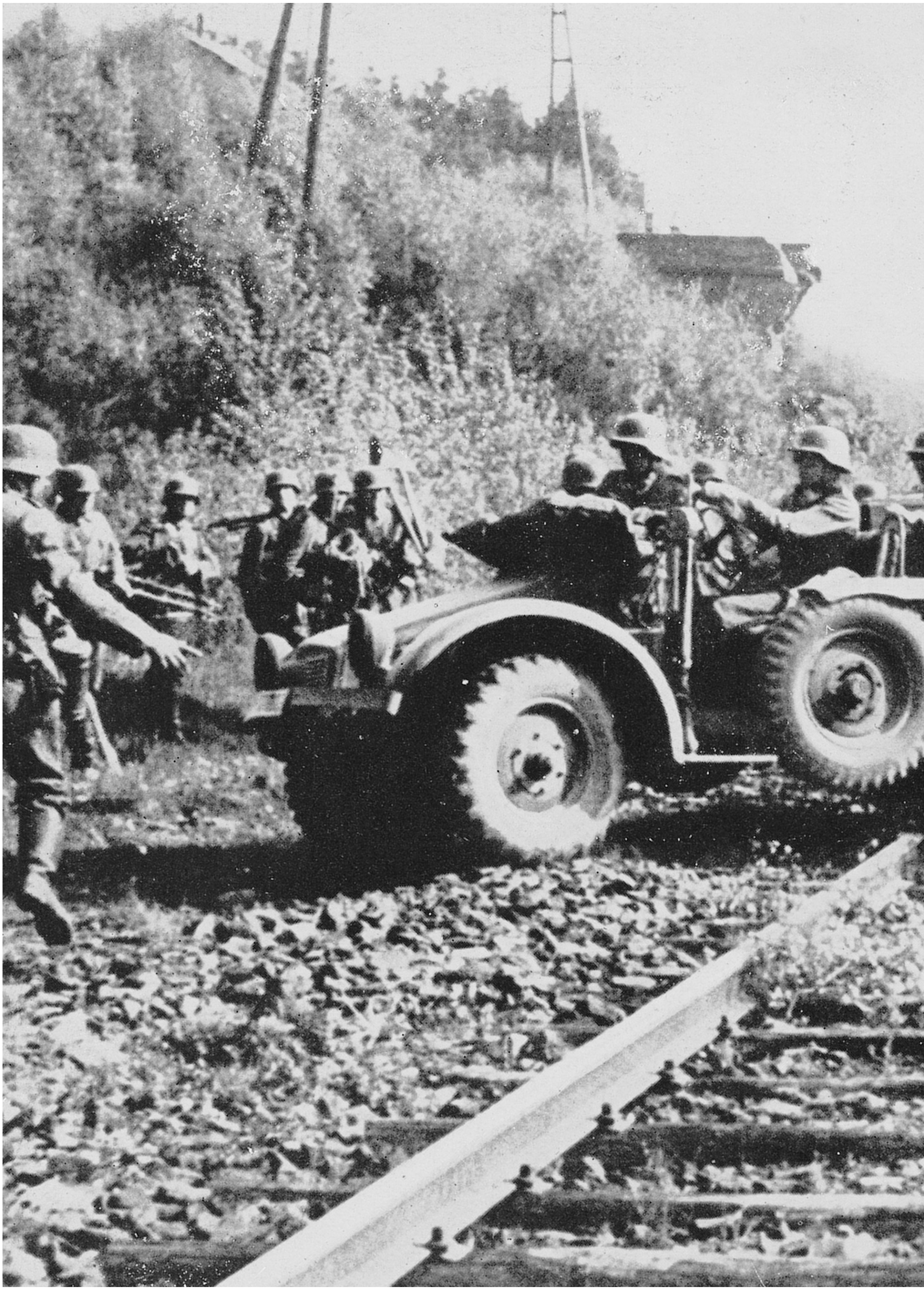
After-action report on the assault by verst InfRgt 371 against the southern front of the Maginot Line near Fermont-Longuyen on 21 June 1940.

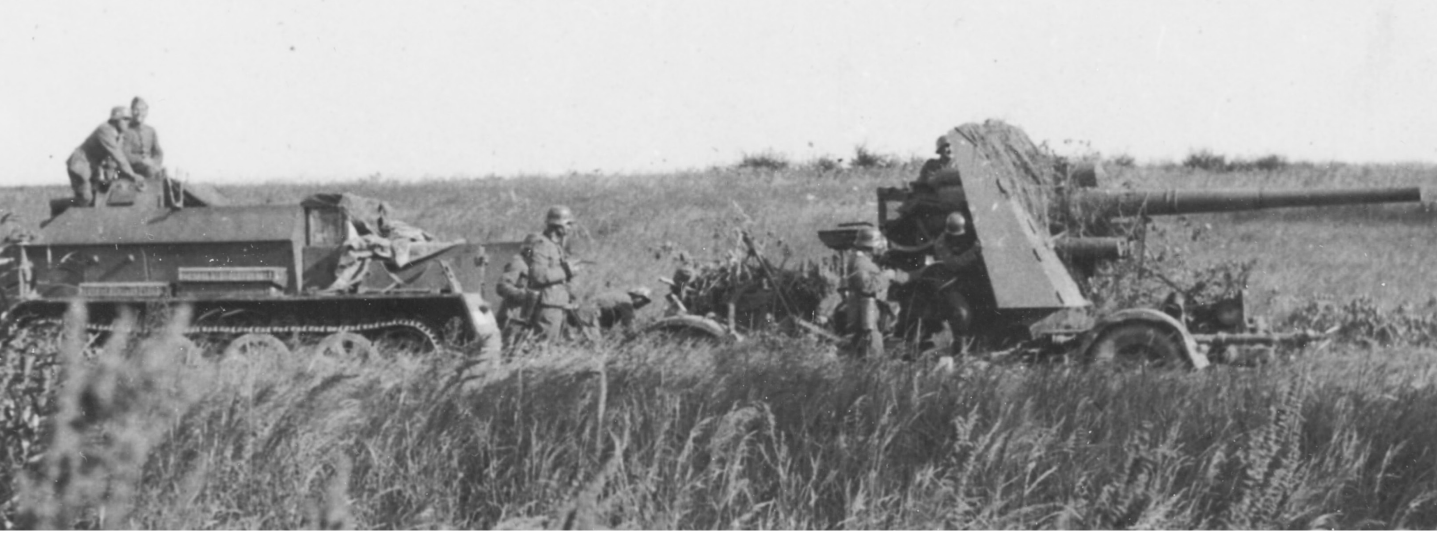
After making a successful breakthrough at the extremities of the Maginot Line at Longuyon, 161.InfDiv received orders to surround the remaining enemy units. The enemy had abandoned some of the armoured cupolas in the main fortress. The division expected the enemy to have low fighting morale in this hopeless situation Due to this assessment the division deployed only few forces

A 3.7cm round has been fired and the gun barrel is at full recoil, as the *Geschützführer* observes the impact on the target. The *Ladeschütze* 2 (loader 2) waits to the rear, prepared to hand another round to the gunner.



The crossing of a railway track required a towing vehicle with sufficient ground clearance. A *Protzkraftwagen* (Kfz 69), which had fully-independent suspension, was eminently suitable for the task. (Getty)





The offensive deployment of the *BunkerFlak* gun was difficult. The driver of the armoured tractor had to reverse his vehicle in order to push the gun slowly towards the target and always be prepared to immediately withdraw.

for the attack by verst InfRgt 371 on a sector of 6km width. Air support, tanks, flamethrowers and special explosives were not available.

The division provided artillery support from s ArtAbt 641 (two batteries 30.5cm, one battery with 21cm mortars) and two battalions of the artillery regiment.

The verst InfRgt 371 was reinforced by two assault troops of PiBtl 241 and by *Stellungs-Panzerjägerkompanie* 313. Also one FlaKAbt 8.8cm was allocated, but arrived too late to be involved in the initial assault.

The *Stosstrupps* (assault troops) consisted of infantry sections, attached pioneer units and anti-tank guns.

Stosstrupp Beneken approached through the dense Bois de Beuveille and at 06:10hrs launched its assault. Despite heavy fire from the flanks, the *Stosstrupp* managed to get close to Werk 166 and 175 [bunkers]. Now 4.7cm PaK was brought closer through very dense thicket then opened fire at rifle loopholes and cupolas with much success. The guns also fired at ventilators and an electricity installation at Werk 175a, causing a temporary failure. Later interrogation of prisoners showed that this total failure of the electric system led to the surrender of the bunker crew.

Machine-gun fire suddenly erupted from Werk 206; this was immediately silenced by fire from our machine guns and 4.7cm artillery. The fire from our 4.7cm was most accurate and effective, destroying a number of machine guns by hits on the loopholes.

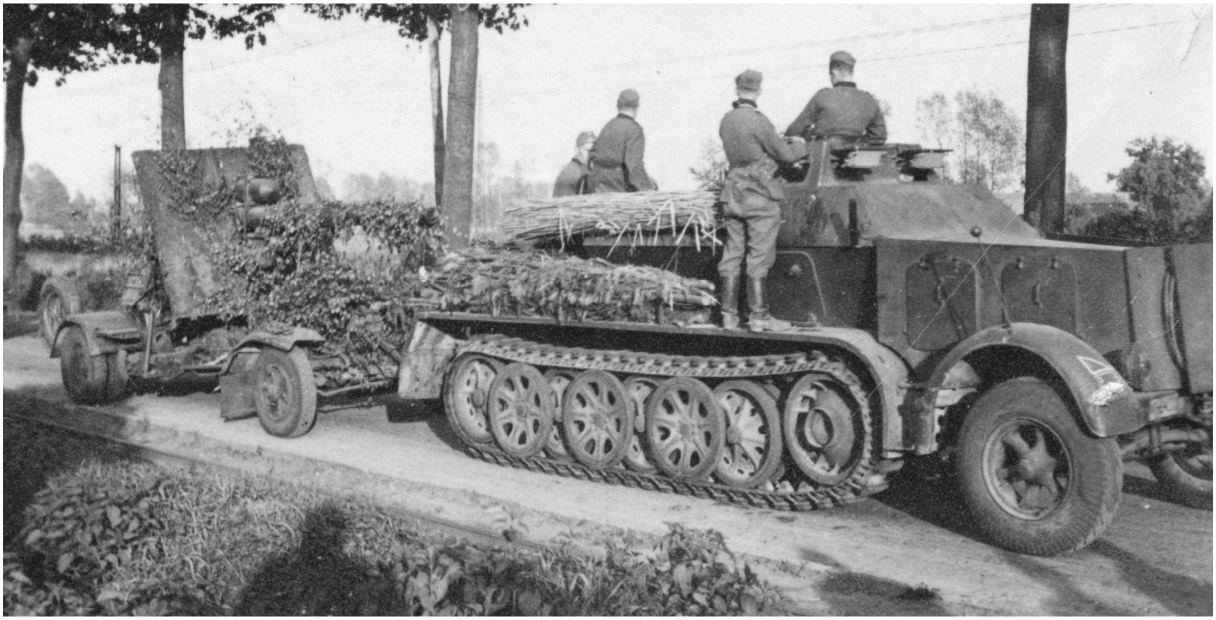
However, during the course of the assault it was noticeable that our preparatory artillery bombardment did not impair the defences. Even numerous direct hits by 30.5cm mortar rounds did not destroy the pillboxes. A far greater expenditure of ammunition would have been necessary to neutralize the bunkers.

> The impact of the 8.8cm FlaK guns, which were called on as the battle progressed, was negligible. Only one penetration through a strong 1.5m-thick wall was achieved, but did not cause any damage within the fortification. However, the FlaK guns were firing at a range of 5,000m: A poor decision to position the guns at such a distance.
>
> While the fire from 3.7 and 4.7cm PaK proved unable to penetrate the armoured cupolas, their accurate fire at loopholes proved to be extraordinarily effective.

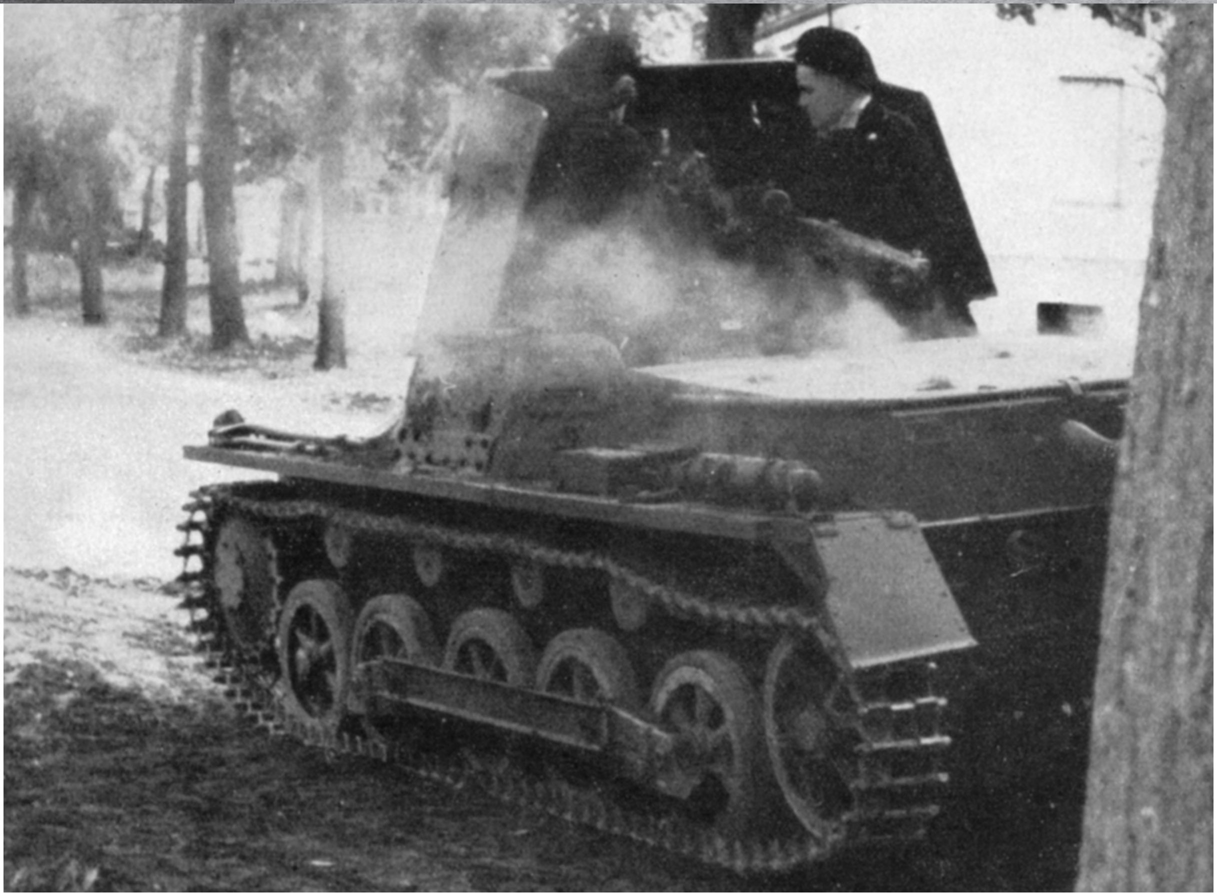
The experiences of verstInfRgt 371 during the assault on a section of the Maginot Line are fascinating. Even fire from the 30.5cm heavy mortar proved ineffective for quickly destroying the mighty fortifications. But it was evident that small artillery pieces, light enough to be moved through dense thicket to advance near to the target, were a valuable asset. However it is interesting that the assault troops of the infantry regiments apparently did not use their 7.5cm *leichte Infanterie-Geschütze* (l IG 18 – light infantry gun), preferring to call on divisional 3.7cm PaK and 4.7cm Böhler anti-tank guns of *Stellungs-Panzerjägerkompanie* 313. The reason for this decision is unknown.

The report concludes:

> Our success was only achieved by neutralizing the defence weapons inside the fortress by fire from 4.7cm PaK, 3.7cm PaK and some FlaK. Under cover of this supporting fire, *Stosstrupps* and pioneers could approach close to the defensive pillboxes to destroy gates and armoured cupolas. The ventilator installations on



The *Bunkerknacker* was highly mobile on a paved road, allowing it to be sent to wherever their fire-support was required.



The breech is still smoking as the loader prepares to load the next round; close-range combat was suicidal for the crew of a *Panzerjäger* I as the vehicle had thin armour and almost no protection against infantry fire and shrapnel.

> the fortress were easily recognizable and destroyed. Any available PaK and FlaK guns were kept at readiness to fire on the amoured turrets and cupolas.

The three PzJgAbt armed with *BunkerFlak* were attached to various units. Nearly all the Panzer divisions involved in the fighting, and several infantry divisions, benefited from the heavy support fire provided by the guns. Battlefield experiences gained with the *BunkerFlak* and the *Schartenbrecher* were generally identical. Now the general staff demanded the regular incorporation of 8.8cm FlaK as '*Sturmgeschütz und schwere Panzerjäger*' (assault guns and tank hunters) in these larger formations; a demand which could never by realized.

Assessment of Weapons

Many of the available after-action reports, other than noting the performance of armaments, also contain a certain amount of 'second class' information.

Many reports collectively concur on a number of important facts. The German *Blitzkrieg* through The Low Countries was so swift that, apart from a few exceptions, the advancing troops were never threatened by any massed tank assaults. The anti-tank guns of the infantry regiments and the more mobile PzJgAbt were in the lead formations, ready to attack enemy amour.

But the few *Panzerjäger* I were deployed ahead of the attack to protect the lead elements of the tank and infantry divisions against the French-built 32-ton B1 heavy tank.

Armed with the 8.8cm FlaK, the *Schartenbrecher* guns played a further important role by attacking hardened positions, pillboxes, armour and dug-in artillery from longer range.

Unfortunately no after-action reports describing what was called ‘offensive tank defence’ have been found.

The 3.7cm PaK

Many combat reports emphasize how ineffective the 3.7cm PaK was against the French tanks of 1940. When the gun first entered service it was received as a basically good and reliable weapon; however, seven years later it was superseded in the gun-versus-tank race. Unfortunately, the basic design of the gun would not allow it to be modified to improve performance.

The type suffered from a number of mechanical problems including weak swing axles, which tended to fracture with some frequency.

Large numbers of the 3.7cm PaK were available front-line troops which used the gun as a support weapon, as did the anti-tank elements of the battalion. The light weight of the gun made it easy for the crew to haul it to a new position on the battlefront; important when under fire.

Panzerjäger I

When compared to the 3.7cm PaK, which was available in very large numbers, the 4.7cm PaK(t), commandeered from the Czech army, had approximately twice the penetration performance. With this data at hand, military planners made the decision (which proved to be quite right) to mount the 4.7cm PaK(t) on a tracked chassis.

With some 100 self-propelled anti-tank guns in service, at least some unit commanders now had the option of ordering these ‘special weapons’ to the frontline to clear a difficult situation.

The PzKpfw II was regarded to be technically fully developed and efficient, but its 2cm *Kampfwagenkanone* (KwK – tank gun) 30 L/55 was regarded as ineffective against the latest tanks.

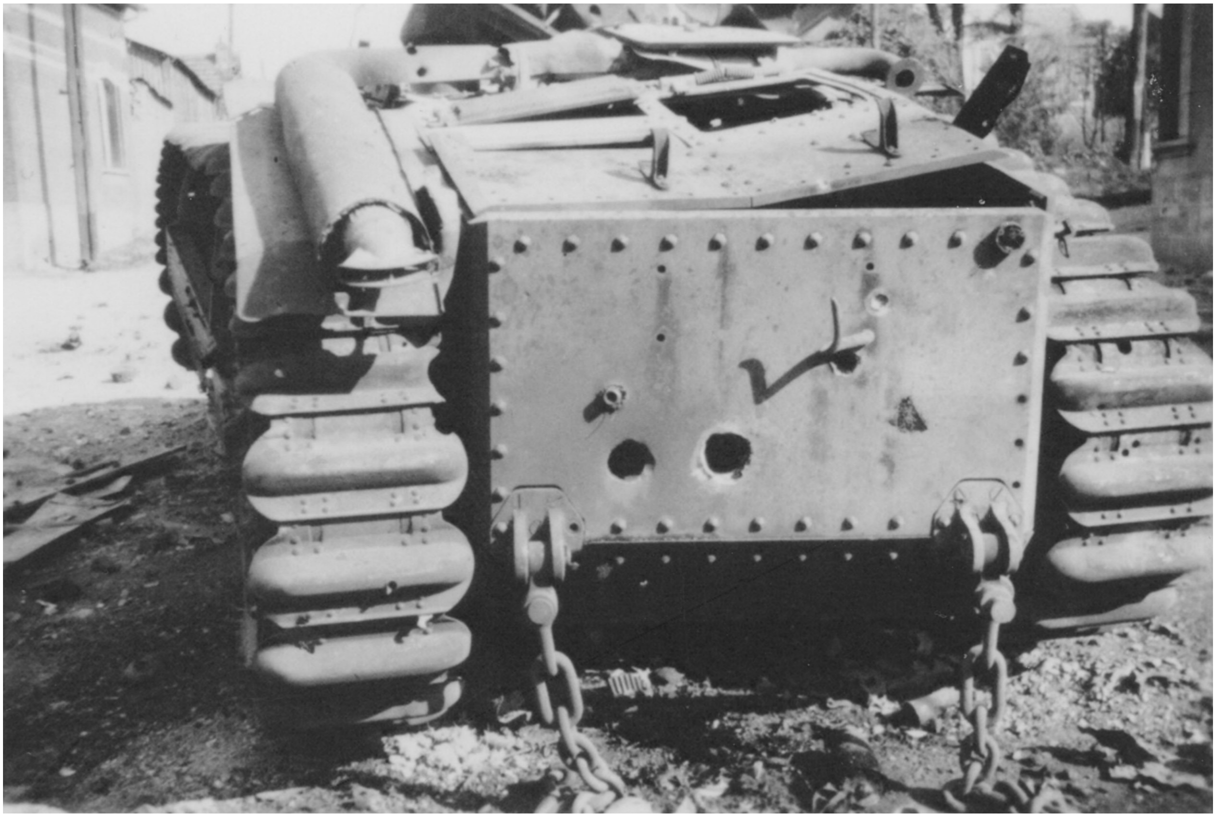
The PzKpfw III (the Ausf E was the most numerous version) was seen by tank crews and unit commanders as being mechanically unreliable. Also the 3.7cm KwK L/45 gun had proved unable to defeat French tanks.

Finally the PzKpfw IV was mechanically reliable and the performance of the 7.5cm KwK L/24 was regarded as good, but it did not have armour able protect the crew against fire from the 25mm light anti-tank gun built by Hotchkiss for the French army.

The above assessments place a sobering light on the all-powerful and proud *Panzerwaffe*, the leader of the *Blitzkrieg*. Of course this is a simple analysis, and focusing on problematic equipment places insufficient emphasis on often forgotten facts: the quality of the leadership, tactics, communications and other equipment. All played a significant part in the rapid conquering of the Low Countries and France.

However, by mid-1940 the inadequate equipment made a qualitative increase necessary. This took slowly take place, in the short run by introduction of SP guns like the *Panzerjäger* I, and by development of more powerful tank guns in the long run. As for the tank, after termination of the French campaign an already planned up-gunning and up-armouring program should start.

Despite its poor automotive qualities, the *Panzerjäger* I proved to be a powerful weapon of offensive fighting tank destroyer units. Furthermore, it was a first and effective attempt to improve the mobility of this anti-tank weapon.



This B1 heavy tank has been hit in the rear plate by two or three rounds of 8.8cm fire from a *Bunkerknacker* of PzJgAbt 525.

8.8cm FlaK 18

German military planners were, as was the OKH, completely aware of the requirement to increase the number of heavy artillery weapons supporting operations by the infantry and armoured forces. As previously noted, the decision to equip the artillery elements in both infantry and tank divisions with howitzers had many drawbacks. A 7.5cm field gun would have given the above elements the versatility to take action against enemy tanks. However, such a weapon had not been produced and planners were forced to accept the 8.8cm FlaK as the only available gun to fulfill the requirements.

The three PzjgAbt (525, 560 and 605) armed with the 8.8cm *BunkerFlak* fought throughout the assault on France alongside various units.

An after-action report from 1./PzJgAbt 525 has been found that comprises the personal recollections of Gustav Steubing and gives a clear account of the hard fighting:

> **9 May 1940**
> Alarm at 15:30hrs and we decamped towards the border.
> **10 May 1940**
> At Trois Ponts we encountered the first road blocks. Our guns were pulled forward. Despite heavy machine-gun fire we complete our task.
> **11 May 1940**
> Pioneers have cleared the road. The 14.Kp of InfRg 49 passes through the section and moves into position. Enemy machine-gun fire forces us to seek cover. My 'B' gun moves up, carefully pushed by the tractor, being directed by a pioneer lieutenant until a bunker is spotted. The gun continues to move until a clear line of fire is reached. Fire is opened at 700m range, the first high-explosive round hits a rifle loophole; after firing several armour-piercing rounds, the French troops abandon the bunker.
> **15 May 1940**
> We receive orders to advance to Yvoir on the river Meuse. But we cannot cross because the bridge is not ready.
> **16 May 1940**
> Our heavy gun and tractor requires a 16-ton capacity bridge. For this reason we move to Dinant and cross the river.
> **19 May 1940**
> At 16:00hrs the assault opens. Our gun moves slowly up, shell after shell leaves the barrel. Heavy machine-gun fire hits our gun and we hear the bullets ricocheting off our armoured shield. We run short of ammunition. *Gefreiter* Hippeli runs to the tractor to fetch ammunition and is wounded. *Feldwebel* Hirschenhain attends to him and sends him back. Two French

soldiers abandon their machine-gun position, although they could have easily destroyed us. Now Wenzel Richard, the co-driver, leaves the tractor and replaces Hippeli on the gun. In this moment the ‘A’ gun comes under fire from French anti-tank guns. The tractor catches fire and ignites the ammunition which burns brightly.

Our ‘B’ gun moves up to fight remaining pockets of resistance. As we pass a factory yard, we come under machine-gun fire from three directions. We cannot proceed nor drive back. In this situation we uncouple the gun, the armoured tractor is turned and we retreat to the rear. At around 17:00hrs we succeed in recovering the gun. The breech has been damaged and all tyres are deflated. Later the gun is again ready for combat. Now we are ordered to Clairfontaine to participate in the assault on the *Hauptwerk* [main bunker]. Together with the artillery we destroy the fortification. Upon noticing enemy tracer fire, we quickly change position. That evening we reach the town of Maubeuge.

20 May 1940

Finally our ‘R’ gun has arrived from Hautmont. We support the assault by InfRgt 49 with two FlaK vehicles at Assevent. The platoon leader, two gun teams, two ammunition trucks and three motorcycles cross to the still-burning Maubeuge. We stop on a dirt track outside the town. German tanks, which should push forward an attack, have been destroyed by a French heavy tank. The ‘R’ gun receives orders to protect an infantry battalion against this tank. After being directed onto a field we drive over an iron stake which destroys the tractor’s oil sump. The vehicle has to be abandoned. Another tractor of a FlaK unit arrives and we retrieve the gun. A short time later we receive a call – tank alert. On arrival we are greeted by heavy machine-gun fire, but manage to destroy three machine-gun nests. During this action the driver of the unarmoured tractor is shot dead. We notice our own infantry retreating, being pushed back by enemy tanks. We move our gun into position on a wide field near a road junction. A short time later we destroy a machine-gun position. Now a French B-1 tank approaches, we open fire and destroy it at a range of 300m. A second tank passes near to us, but it is partly obscured by trees and a wooden hut. The French heavy tanks carry a white heart on the turret, indicating that they are from Weygand’s elite force sent to halt our advance. Just as the turret slowly turns towards us, an 8.8cm shell blows the tank apart. Now our infantry gets into position and opens fire with their 7.5cm guns. The enemy suffers severe losses. Now more and more enemy machine guns and rifles open fire at my gun, my right thigh is hit and penetrated. Our ammunition is used up. Now the French increase their pressure, trying to force us to retreat. Being immobilized, I remain with my gun.

In contrast to the towed *BunkerFlak*, when the 8.8cm FlaK was mounted on an SdKfz 7 half-track tractor it could fire at a much higher trajectory. But it is questionable as to whether it could be used as an anti-aircraft gun.

Tanks such as the British-built Cruiser MK IV were no match for the *Panzerjäger*. Although highly-mobile the type had poor armour protection which was easily penetrated by German anti-tank artillery.

The towed FlaK guns were certainly effective at defeating tanks or destroying bunkers, but only under appropriate circumstances. Towed by an armoured tractor, the heavy 8.8cm FlaK was slow and difficult to position making it an easy target for almost any weapon. The exact number lost in action is not known, but this report by Steubing clearly shows the danger faced by the gun's crew.

The three PzJgAbt – 525, 560 and 605 – that were established in late summer 1939 and rearmed with 8.8cm FlaK guns, were disbanded at the end of the French campaign. Although the origin of the order is known, no reason for the disbandment was attached. The most plausible reason is that the gun teams failed in combat, possibly due the shortcomings of these cumbersome towed guns.

However, the six FlaK 18 mounted on *schwere Zugkraftwagen* (s ZgKw – heavy half-track tractor) 12t (SdKfz 8) appear to have fulfilled expectations. This unit was not disbanded, but continued in combat until the last vehicle was lost. A similar vehicle was produced later by mounting a FlaK 18 on a s ZgKw 18t (SdKfz 9) chassis.

Numerous 8.8cm FlaK in service with *Luftwaffe* anti-aircraft units were successfully deployed to support infantry and tank attacks.

An official evaluation dated January 1941, examines the efficiency of the FlaK 18, during the western campaign; some ten tank divisions and numerous infantry divisions gave the weapon a positive vote.

The general staff gave made this concluding comment:

> The 8.8cm FlaK has fully proven its efficiency. We agree with the incorporation of the gun as an assault and heavy anti-tank weapon in the infantry divisions as suggested by the *Organisationsabteilung*.

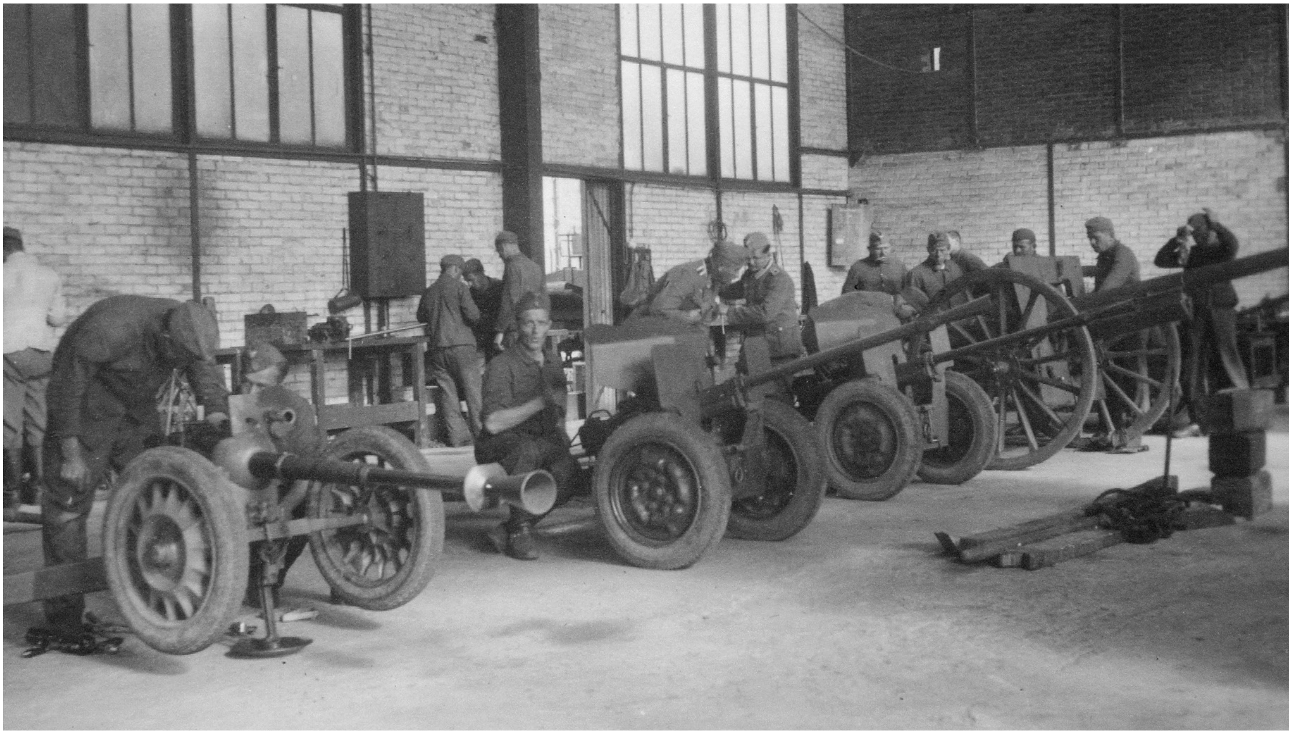
This requirement, and also the planned regular inclusion of *Sturmgeschütz* in the infantry divisions had been suggested before the war. But the *Organisationsabteilung* decided all FlaK anti-tank weapons would remain on *Heerestruppen* level.

By mid-1940, the *Panzerjägertruppe* had gained much precious combat experience, but their mainstay weapon, the 3.7cm PaK, was now obsolete as an anti-tank weapon and the new 5cm PaK 38 had just entered production.

To the outside world the *Organistationsabteiling* had begun preparations to convert the army into a *Friedensheer* (peace-time army), but in reality this was a simple act of subterfuge.

Would the *Panzerjäger* be fully prepared for the future?

When France capitulated, all intact enemy equipment was collected then inspected and many used again as *Beutewaffen* (captured weapons). German engineers inspect and evaluate French-built 25mm anti-tank guns and a 75mm M 97 field gun before refurbishment and distribution to army units.



EN

6

Preparing for Seelöwe

In 1939, the OKH began drawing up plans to neutralize what the Reich considered to be their most dangerous enemy in the west – Great Britain.

Although only an outline plan at that time (France had yet to be invaded), German military authorities came to the conclusion that, other than crossing the English Channel, two main obstacles had to be overcome: the Royal Navy (RN), at that time the most powerful fleet in the world, and well-trained Royal Air Force (RAF). Consequently, the Germans thought that an invasion would be unnecessary if both threats were eliminated, leaving Great Britain defenceless. Also, the OKH was convinced that this would force the British to open (one-sided) peace negotiations.

Looking at how modern diplomacy works, the view expressed by the OKH appears crude and very naïve.

However, when the *Luftwaffe* could not destroy the RAF in the Battle of Britain, the Germans intensified their preparations for an invasion.

On 30 August 1940, after the *Wehrmacht* had forced France to capitulate, the OKH ordered:

> Mission
>
> This order is to be issued to all elements of the armed forces to begin preparations for a landing on the south coast of England. The purpose of the attack is to neutralize the British motherland so as to halt the continuation of war against Germany. If necessary, the country will have to be occupied in its entirety. The order for the execution of the campaign depends on the political situation. However, all preparations have to be completed to launch

For the planned invasion of Great Britain, a lack of specialized landing craft forced military planners to commandeer all available types of vessel including river barges. A *Panzerjäger* I from PzJgAbt 641 (note the white cross), has been loaded in the hold of a river barge. At the time the PzJg I was the most powerful mobile anti-tank weapon in German service. A number of horses have also been loaded to haul supply transport.

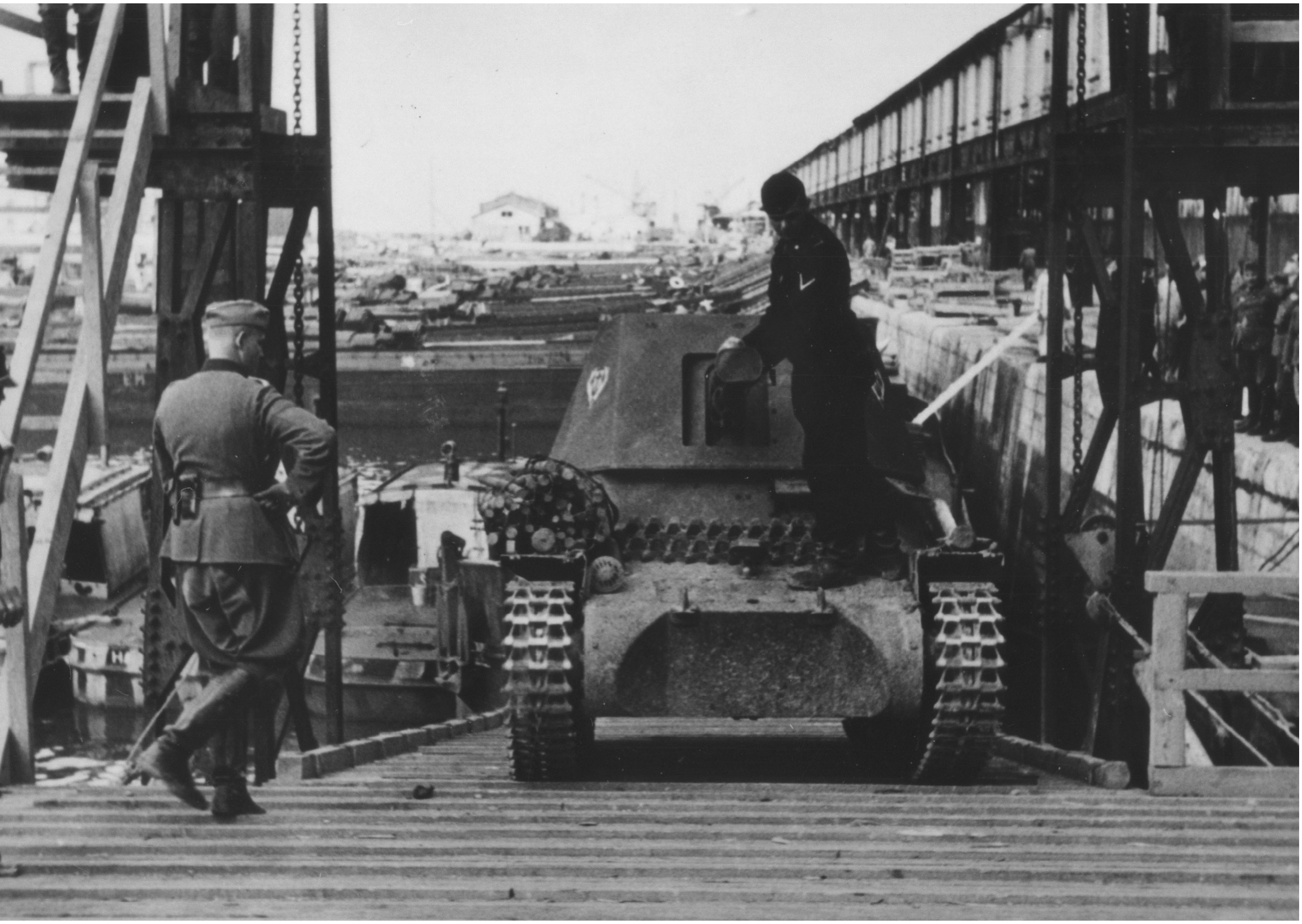
> the operation on 15 September at the earliest. It is the task of the army to land a large force in southern England capable of defeating the British forces and ultimately occupy the capital: London.

Opposite: A *Panzerjäger* I from PzJgAbt 641 in the hold of a river barge: note the muzzle brake on the gun is polished metal; an indication that a replacement has recently been fitted.

The *Kriegsmarine* (German navy) had been made responsible for safeguarding operations in the Channel, and was also involved in supplying landing vessels and barges. A weakened *Luftwaffe* would still be required to stop attacks by the RAF.

As for the army, it was expected to survive the crossing despite the expected and constant attacks from the RN, the RAF and shore artillery.

It seems incredible that the order allowed only 14 days to make preparations for such a large invasion. Two army groups would deployed for the assault; *Heeresgruppe* (Army group) 'A' with 16.Armee and 9.Armee was to form the spearhead, with *Heeresgruppe* 'B' held in reserve.



Below: A *Panzerjäger* I from PzJgAbt 521 (note the stag's head symbol) being reversed down a loading ramp to embark on a river barge. Due to a lack of heavy lifting equipment this procedure was frequently practiced.

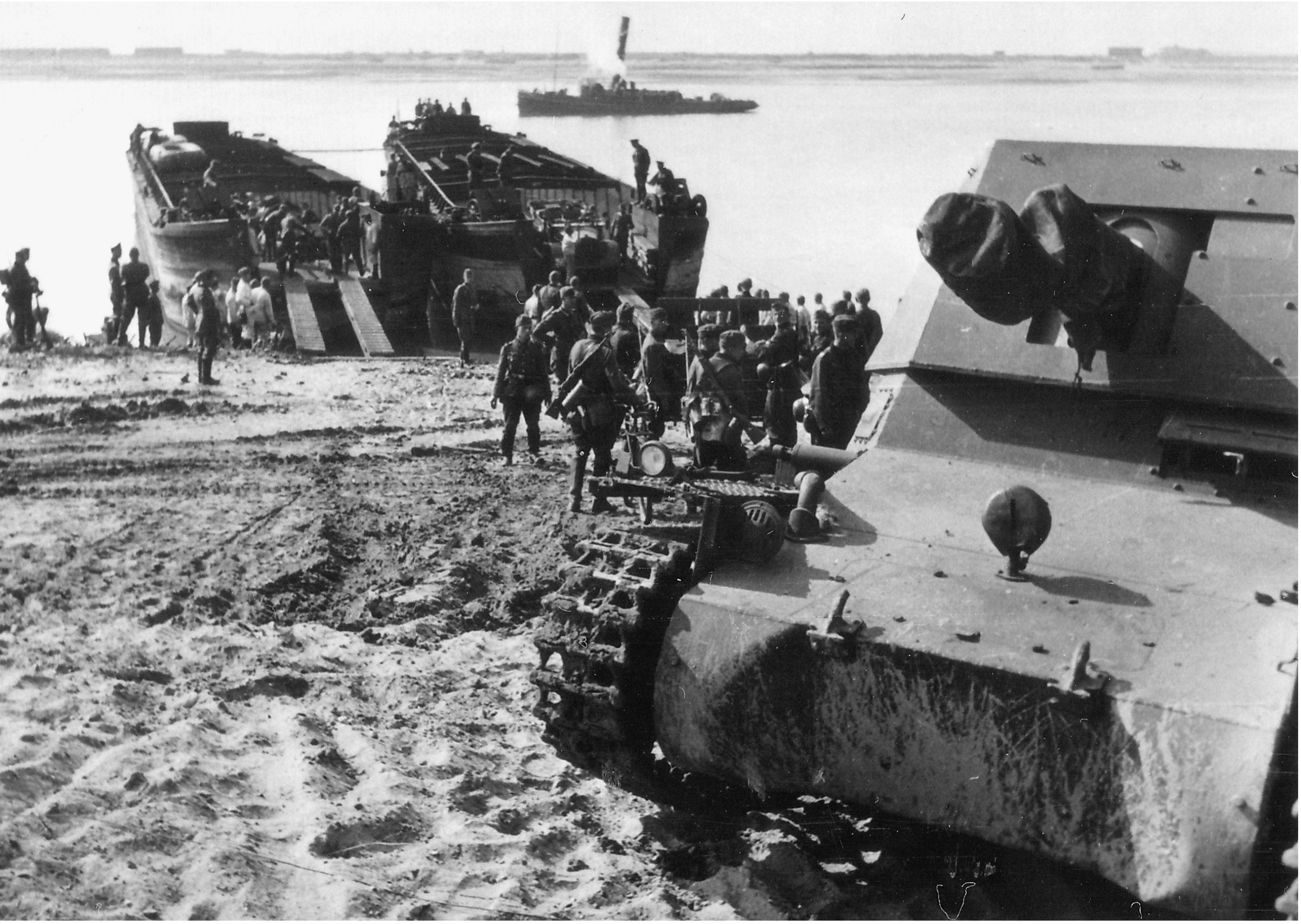
N8
N5

As for the *Panzerjägertruppen*, standard divisional *Panzerjäger* units were to be included in the landing force. Furthermore, *Heerestruppen* units supported by the tank and infantry divisions were provided with independent *Panzerjäger* and *Sturmgeschütz* battalions.

The invasion of Great Britain would not be achieved quickly, as British forces (and the people) would put up a very strong resistance. These German forces intended for the invasion continued to perform large-scale exercises, training with the landing vessels. Among the army troops involved were PzJgAbt 521 and 643 equipped with the 4.7cm *Panzerjäger* I.

In December 1940, after Hitler made his decision to attack the Soviet Union, *Unternehmen* Seelöwe (Operation *Sea Lion*) was officially postponed. The commitment to *Unternehmen* Barbarossa had made any further preparations for the landing operation impossible.

Opposite: Parked alongside this *Panzerjager* I from PzJgAbt 641 is an Adler 3GD (Kfz 12) light field car used for towing the 3.7cm PaK: note the tactical symbol for a tracked anti-tank unit painted on the mudguard. Horse-drawn supply wagons are visible in the background.



Below: The Germans converted a river barge into a landing vessel by cutting off a section of the bow and mounting wooden ramps for loading and unloading. At sea, the opening would be closed by a simple door.

Close-combat Weapons

7

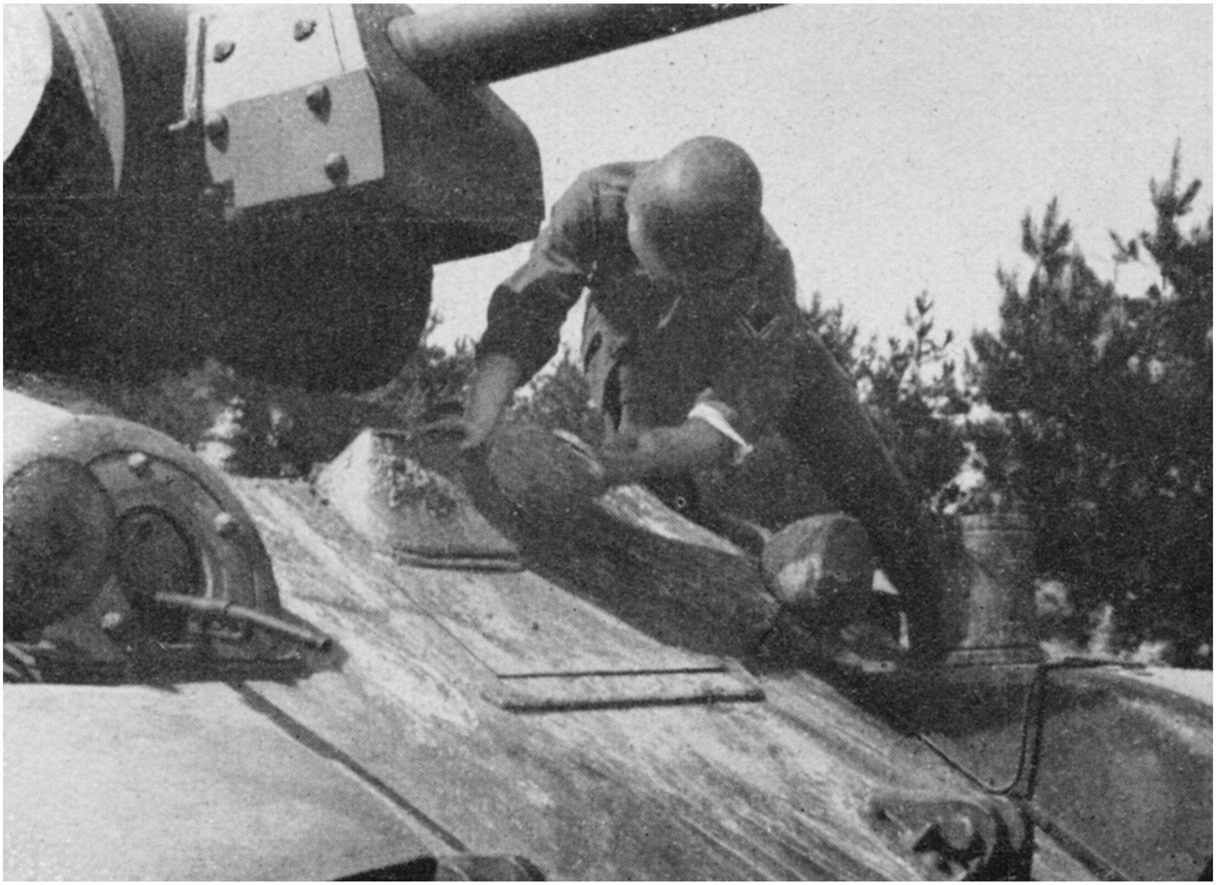
Any book detailing the *Panzerjägertruppen* would be incomplete without featuring all types of anti-tank weapon and improvised devices.

When the first armoured vehicles appeared on the World War I battlefront, the infantry lacked a dedicated anti-tank gun and were forced to make improvised weapons to defeat this new menace.

At the beginning of World War II, advancing German formations were supported by *Panzerjäger* units equipped with weapons, including the 3.7cm PaK, which were capable of defeating most ‘modern’ armour. However in 1941, after the attack on Russia, the situation would soon change. After a few weeks of fighting, German commanders became aware that they were facing a (numerically) far superior enemy, and called all available reserves to the battlefront – vitally important if the rapid gains of territory were to be held. As the fighting progressed Soviet forces began to receive increasing numbers of the more modern T-34 medium and KV heavy tanks which were then deployed on the battlefront. If German anti-tank defences failed, then the infantry would be forced to counterattack using all means available – an individual soldier was expected to fight a tank. Most of the weapons (devices) were ‘developed’ as an expedient after the tank shock initially suffered by German forces during the first six months of *Unternehmen* Barbarossa.

To rectify the problem, the *Waffenamt* was forced to take appropriate action. In parallel to the development and introduction of more sophisticated anti-tank weaponry (see Chapter 8), a number of instructional bulletins were published to instruct infantry troops how to make and use improvised anti-tank devices.

The Hafthohlladung 3kg (Haft Hl 3), which entered service in September 1942, was produced using the shaped-charge principle. When detonated, a metal-lined container would be accelerated to form a concentrated jet of particles which travelled so fast that even the strongest armour plate could be penetrated. The heat generated and the multiple metal fragments devastated the interior of the tank.



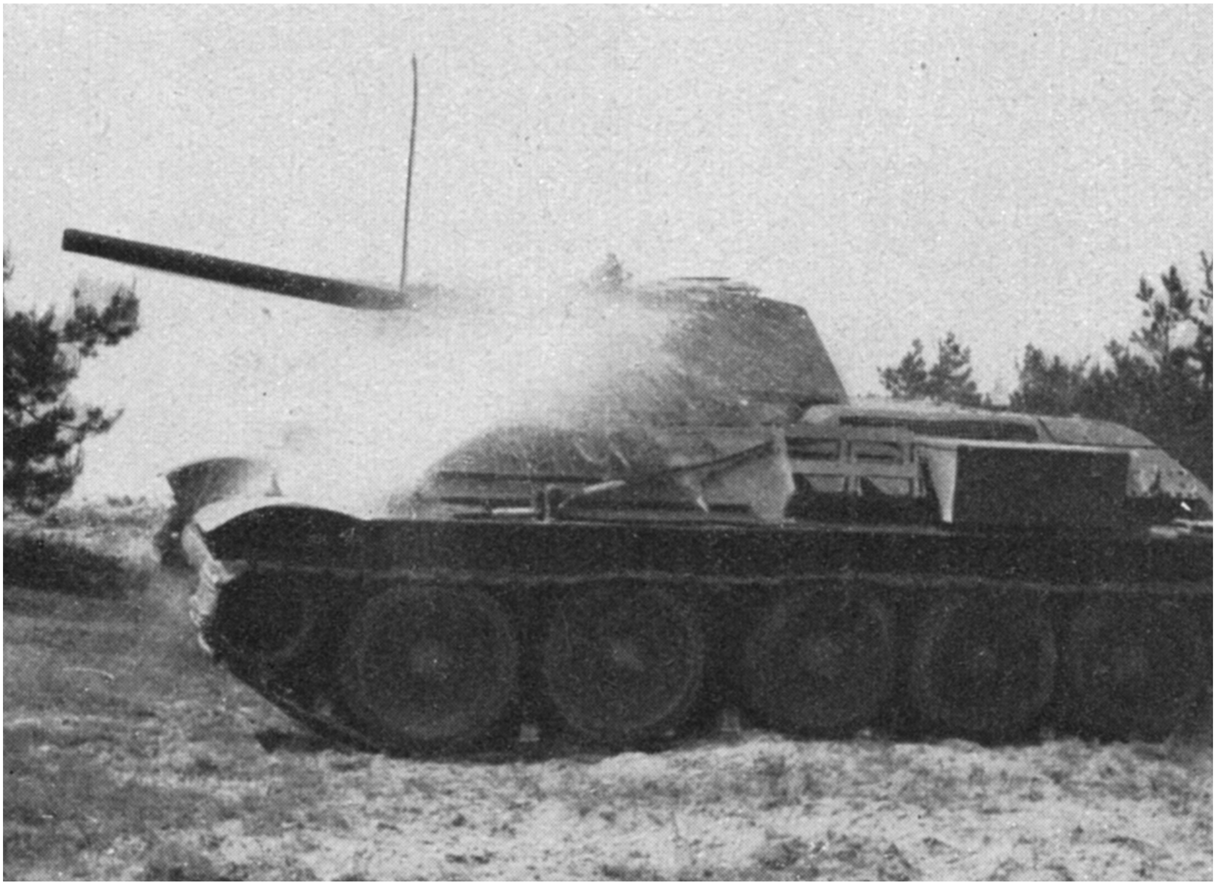
A soldier demonstrates how to ‘blind’ the tank driver by smearing a mixture of oil and mud over his vision visor; an almost suicidal mission.

It is important to differentiate between the many devices available to infantrymen in the field, and those close-combat weapons purposely designed to destroy even an enemy heavy tank:

The leaflet differentiates between ‘blinding’ devices and destructive devices:

1) ‘Blinding’ devices.
A number of methods to obstruct the view of a tank crew to allow a tank destruction team to make their attack in relative security.

Blendkörper
The Blendkörper (BK) was a small glass bottle filled with a special liquid. The bottle would be thrown at the frontal armour of a tank where it would shatter and, depending on weather conditions, produce thick smoke for some 15 to 20 seconds. For maximum effect it was essential to aim a Blendkörper device in front of the turret.



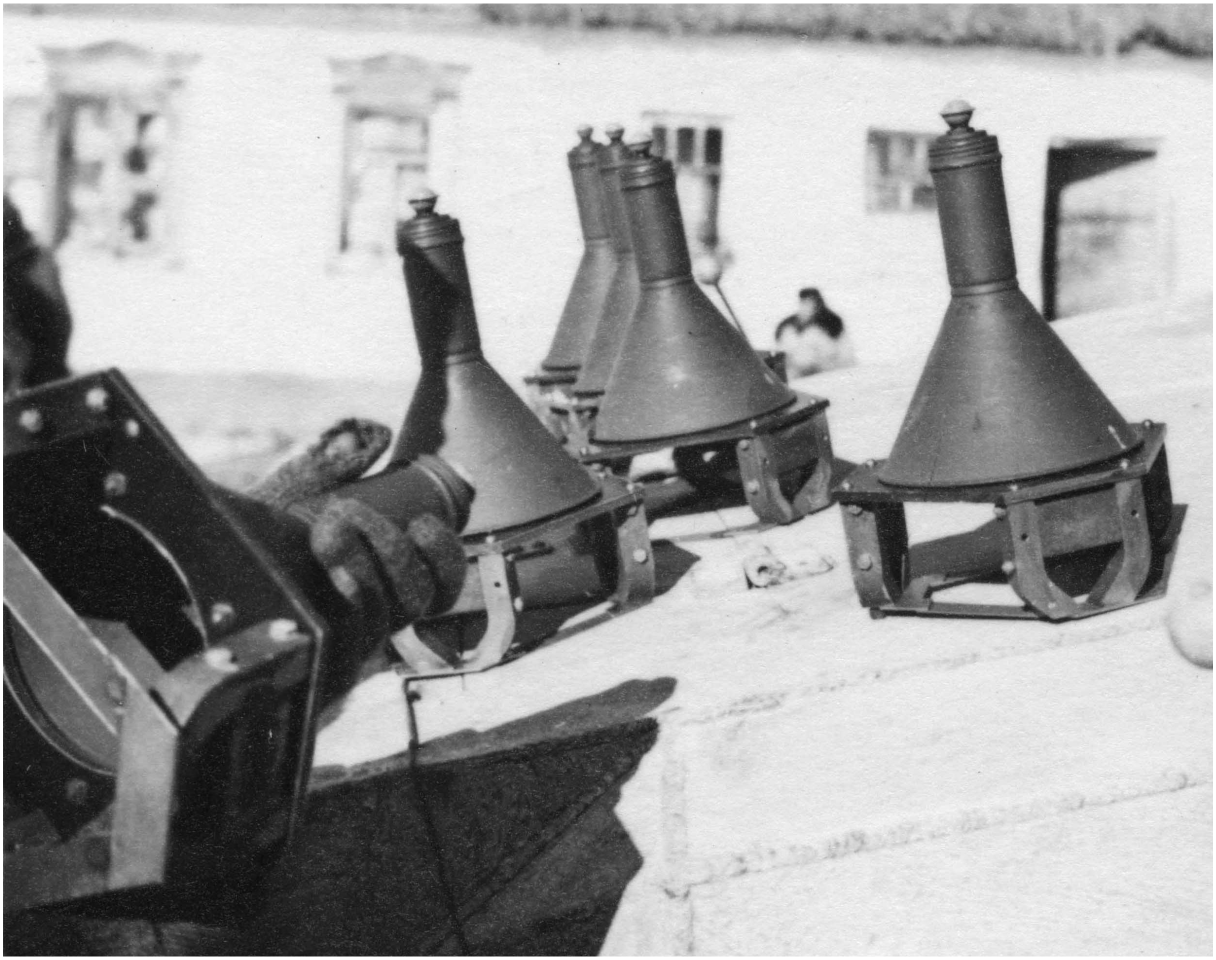
A Blendkörper has been thrown at a T-34. It was intended to have a 'blinding' effect on the driver and gunner which could last for 15 to 20 seconds.

Nebelhandgranate 39
A thrown smoke grenade which produced smoke for some 7 seconds after ignition: The resulting smoke screen covered the target for up to 2 minutes.

Nebelkerze 39 and Nebelkerze S
A candle that produced smoke for up to 5 seconds after ignition (NbK 39) or instantly (NbK S). The smoke screen lasted for up to 7 minutes.

Rauchröhre 39
A device used by pioneer companies for smoking enemy troops out of bunkers and pillboxes. It worked in the same manner as the NbHGr 39, but produced less smoke.

Improvised measure
A bucket filled with thick, muddy water, paint or even cooking fat could be used to smear over the driver's vision visor on a tank. Or even a bottle



Five HL 3 are stacked on the bonnet of an SdKfz 251. The charges were fitted with magnetic feet which would cling on to any metal surface. After the fuse at the top had been pull, the weapon detonated a few seconds later.

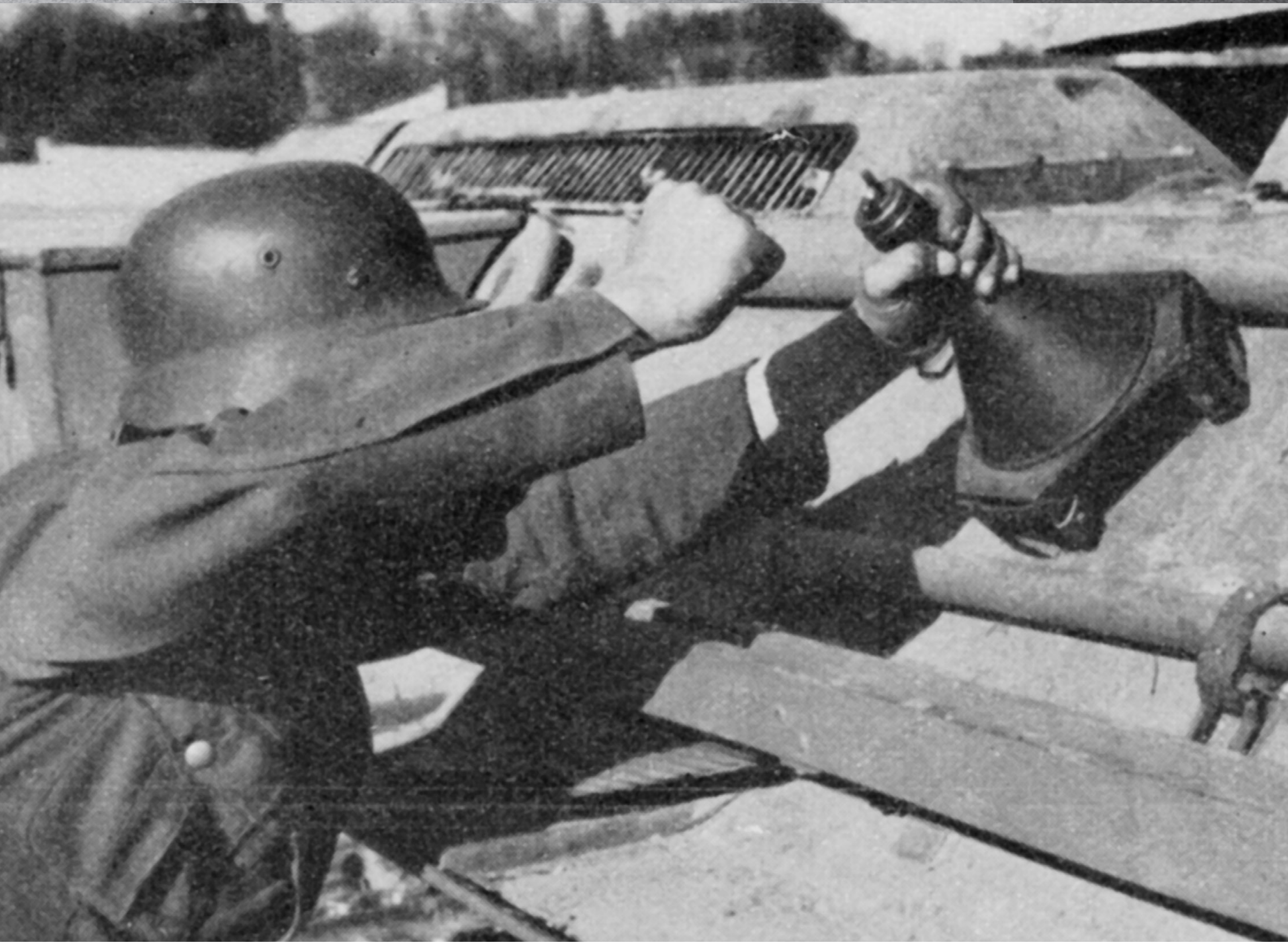
filled with a thick muddy liquid could be thrown to obscure a driver's view of the battle field.

Both of the above were certainly the most desperate measures to halt an enemy tank.

2) Destruction methods. To damage, immobilize or destroy an enemy tank.

Flamethrower
This weapon carried by pioneers for attacking concrete bunkers and pillboxes, can be successfully used against a stationary or immobilized tank.

Molotov cocktail
Typically a bottle filled with flammable liquid which, when thrown, had

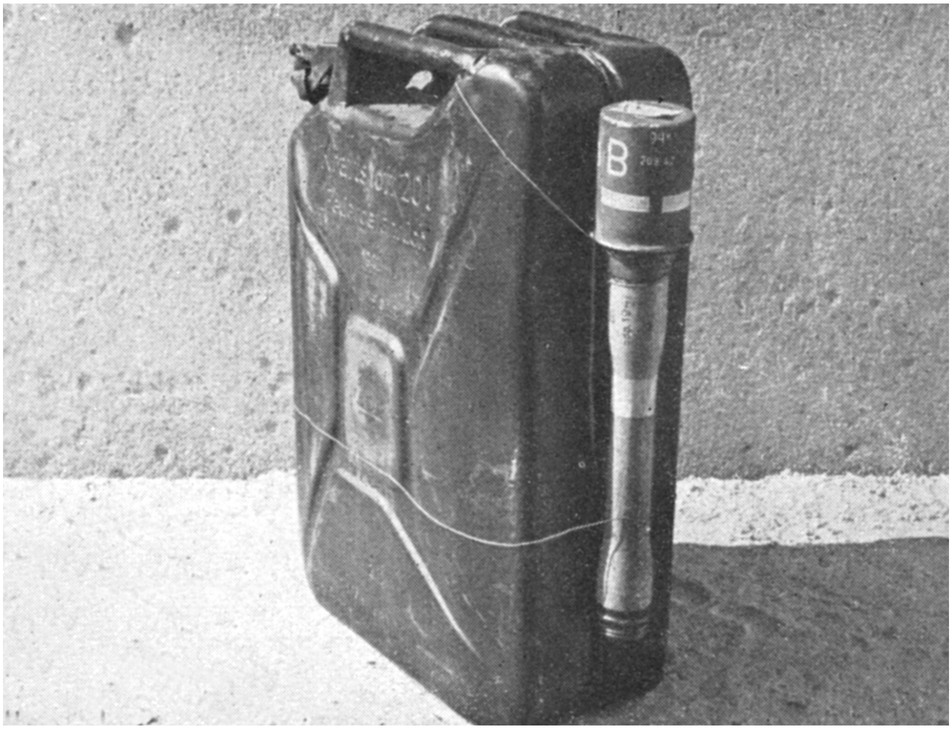


A member of an anti-tank combat team has placed an Hl 3 on the side of the superstructure of a T-34 tank and initiated the fuse. The weapon was relatively easy to use due to its small size.

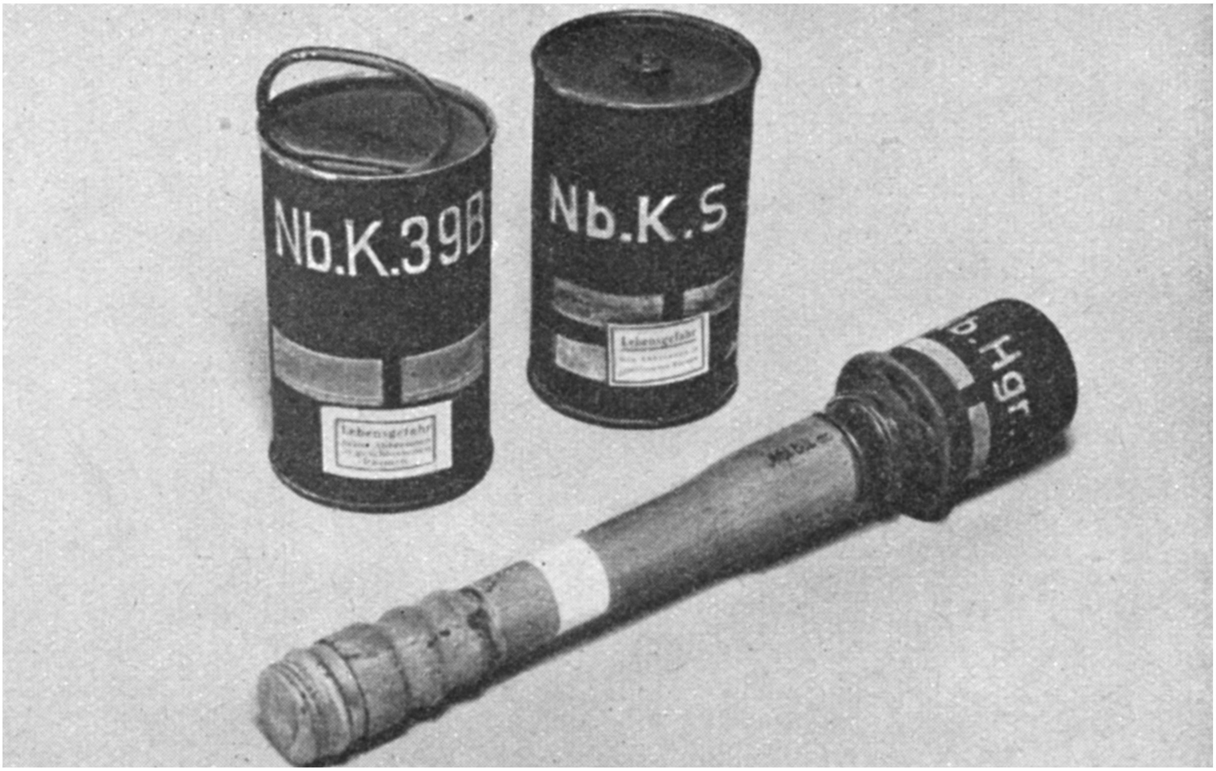
an effect similar to that of a flamethrower, but less effective. A fuel can with hand grenades attached could also be thrown onto the engine cover of a tank, setting the engine on fire.

Hafthohlladung (3kg)

Introduced in September 1942, the Hafthohlladung (adhesive hollow charge) which was magnetically adhered to the steel armour on a tank. The bottle-shaped Hl3 contained 3kg of explosive and the cone-shaped Hl3.5 contained a 3.5kg explosive charge capable of penetrating armour up to 14cm thick. When first introduced it was the most effective close-combat weapon in German service. Military planners were aware that the Soviets could copy and produce a magnetic weapon and ordered that all tanks and assault guns were to have Zimmerit anti-magnetic coating applied.



Another type of weapon available anti-tank combat teams was a *Stielhandgranate* (stick grenade) tied to a 20-litre jerry can of petrol. This improvised weapon was intended to attack the louvred engine cover on a T-34. However, the thrower had to be quick and strong to throw the 20kg weapon onto the tank, while the fuse on the grenade was ticking.

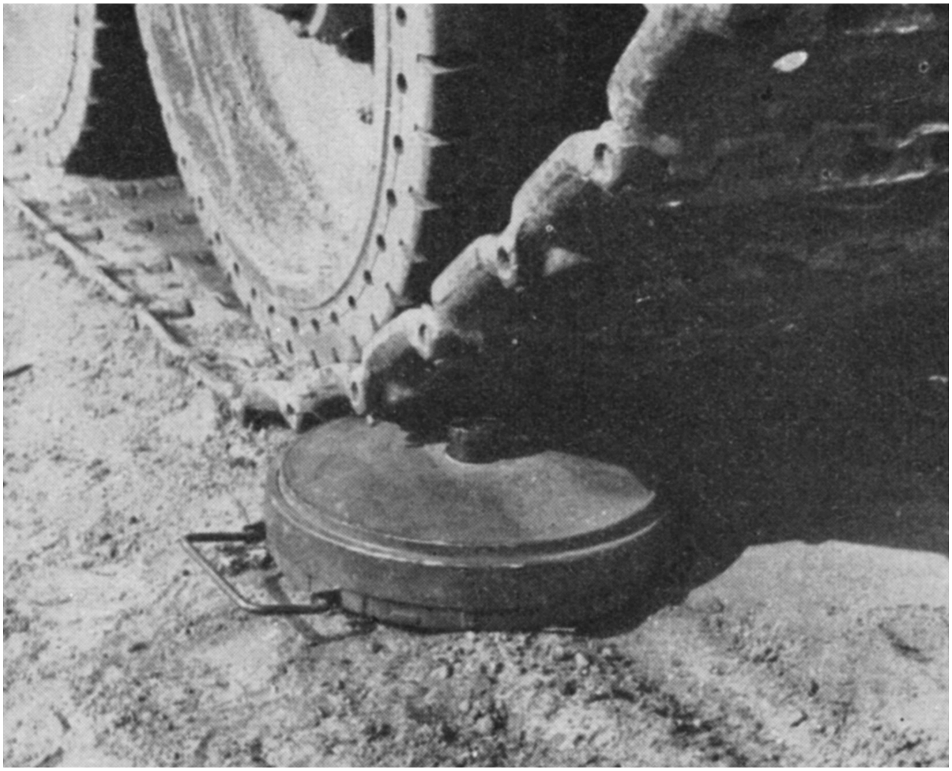

Nb.K.39B
Nb.K.S
b.Hgr.
Lebensgefahr

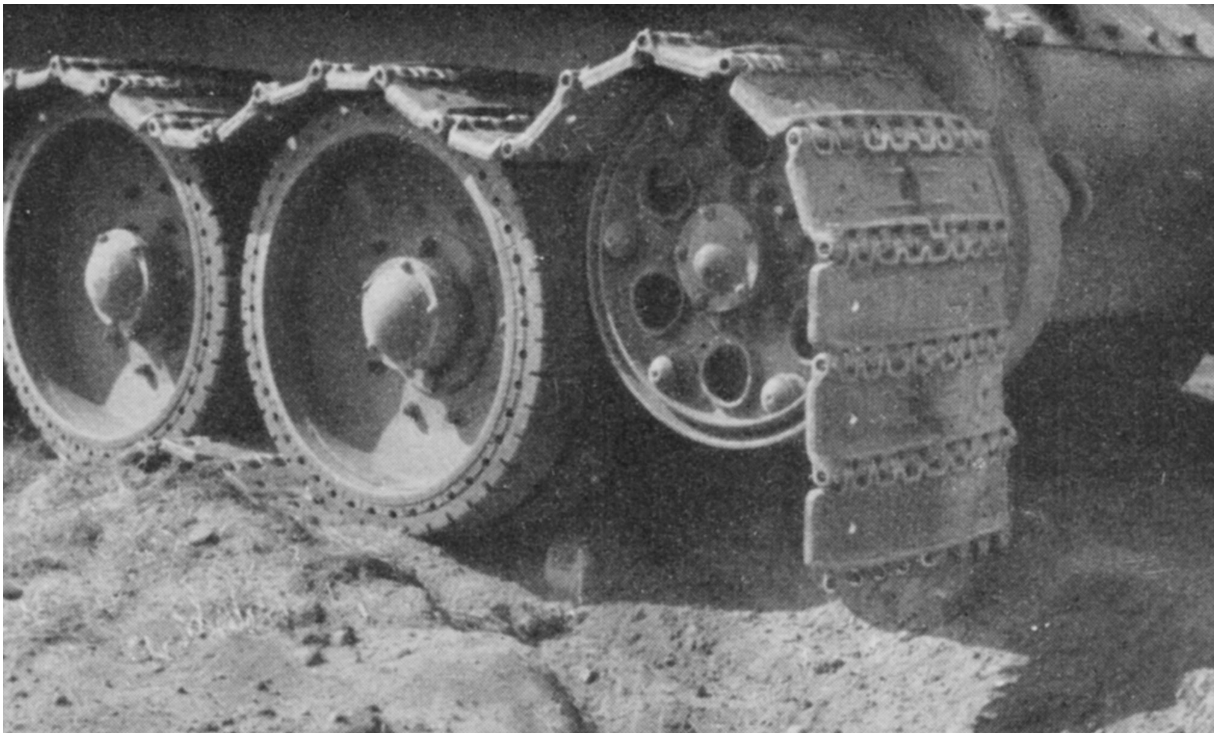
Above: The Nebelkerze (NbK) 39, the Nebelkerze (NbK S) and the Nebelhandgranate (Nb Hgr) generated a smoke screen to 'blind' the tank.

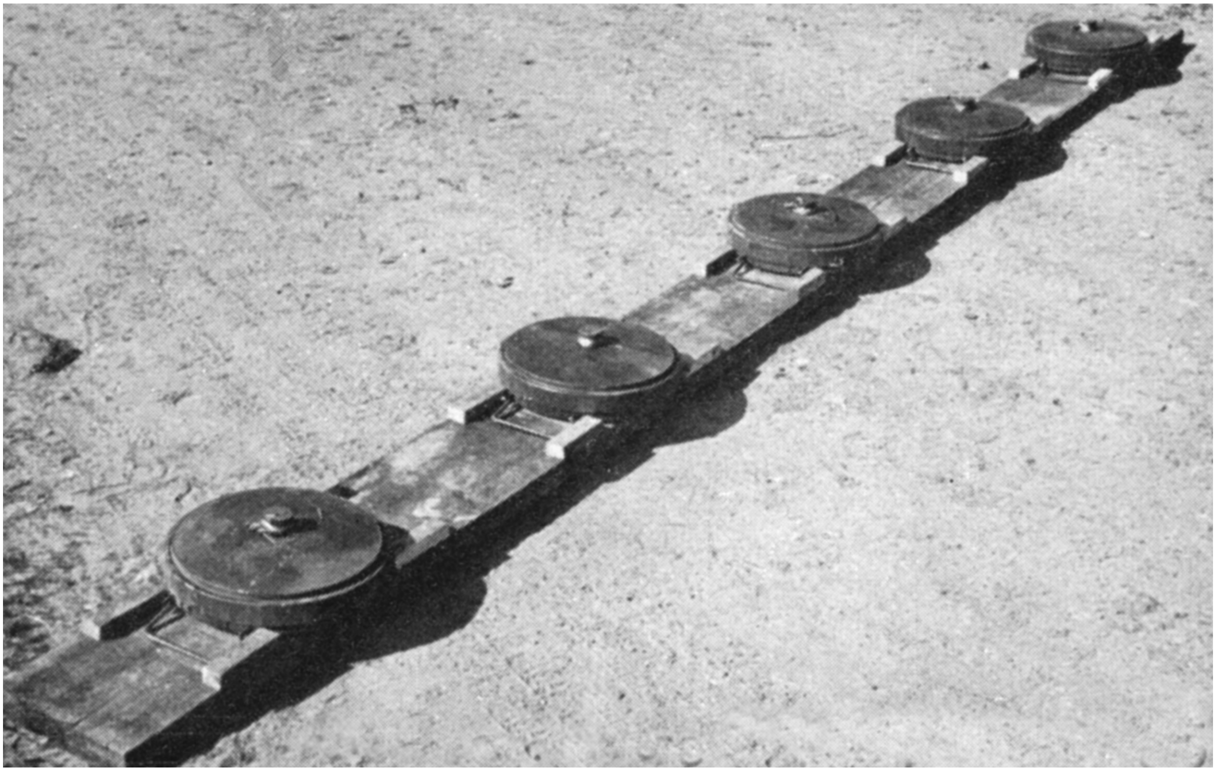
Left: The 'Molotov Cocktail' was a commonly used improvised weapon with which to attack an enemy tank. If thrown accurately, the burning fluid would enter the engine compartment through the louvres igniting fuel and oil.

Right: Mines were an effective means to immobilize a tank. Here the track on a T-34 is close to striking the detonator of a T-Mine 35.

Below: When detonated a T-Mine was sufficiently powerful to destroy the track, effectively immobilizing the tank.







Five T-Mine 35 have mounted on a plank of wood ready to be slid across a road to halt advancing enemy armour. This arrangement could be kept hidden by the side of the road and pulled into position at the very last moment.

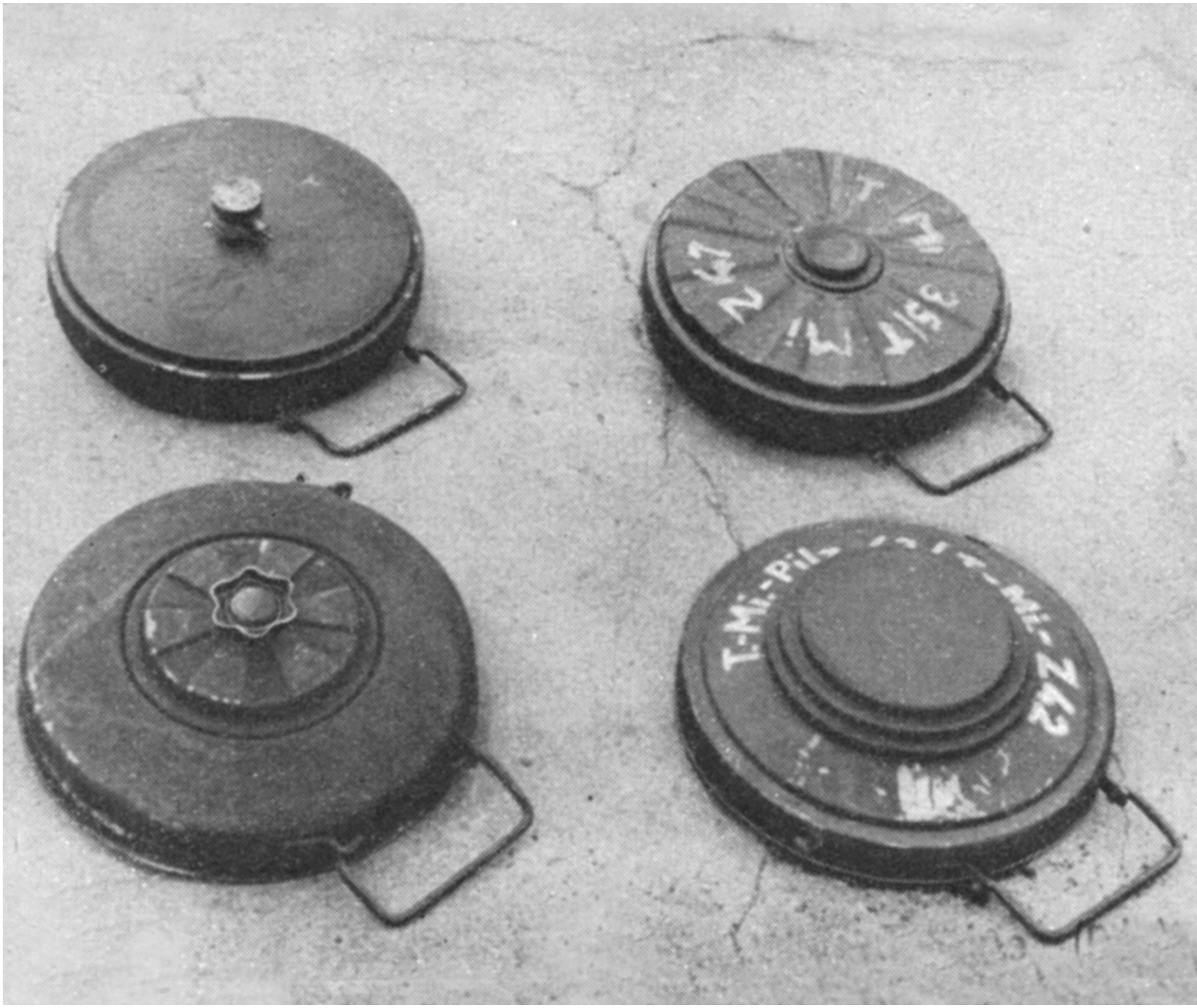
Tankmine (T-Mine)

The T-Mine 35, 35 Stahl, 42 or 43 was a pressure triggered anti-tank mine containing 5.5kg of TNT or equal amounts of Amatol and TNT. Placed on or just below the surface, it was sufficiently powerful to damage the track and running gear of a passing tank, immobilizing the vehicle. It was also possible to fit the mine with a timing device, to allow it to be thrown on a tank normally. German after action-reports note that the Russians extensively used large numbers of captured mines, often 'improving' their destructive power by placing a (German) 21cm grenade under each mine.

Sprengmittel (explosives)

A number of explosive devices were developed for pioneer units and all differed in shape and weight (destructive power); all designations here refer to an explosive device:

- Bohrpatrone 100g
- Sprengkörper 200g
- Sprengbüchse 1kg
- Geballte Ladung 3kg

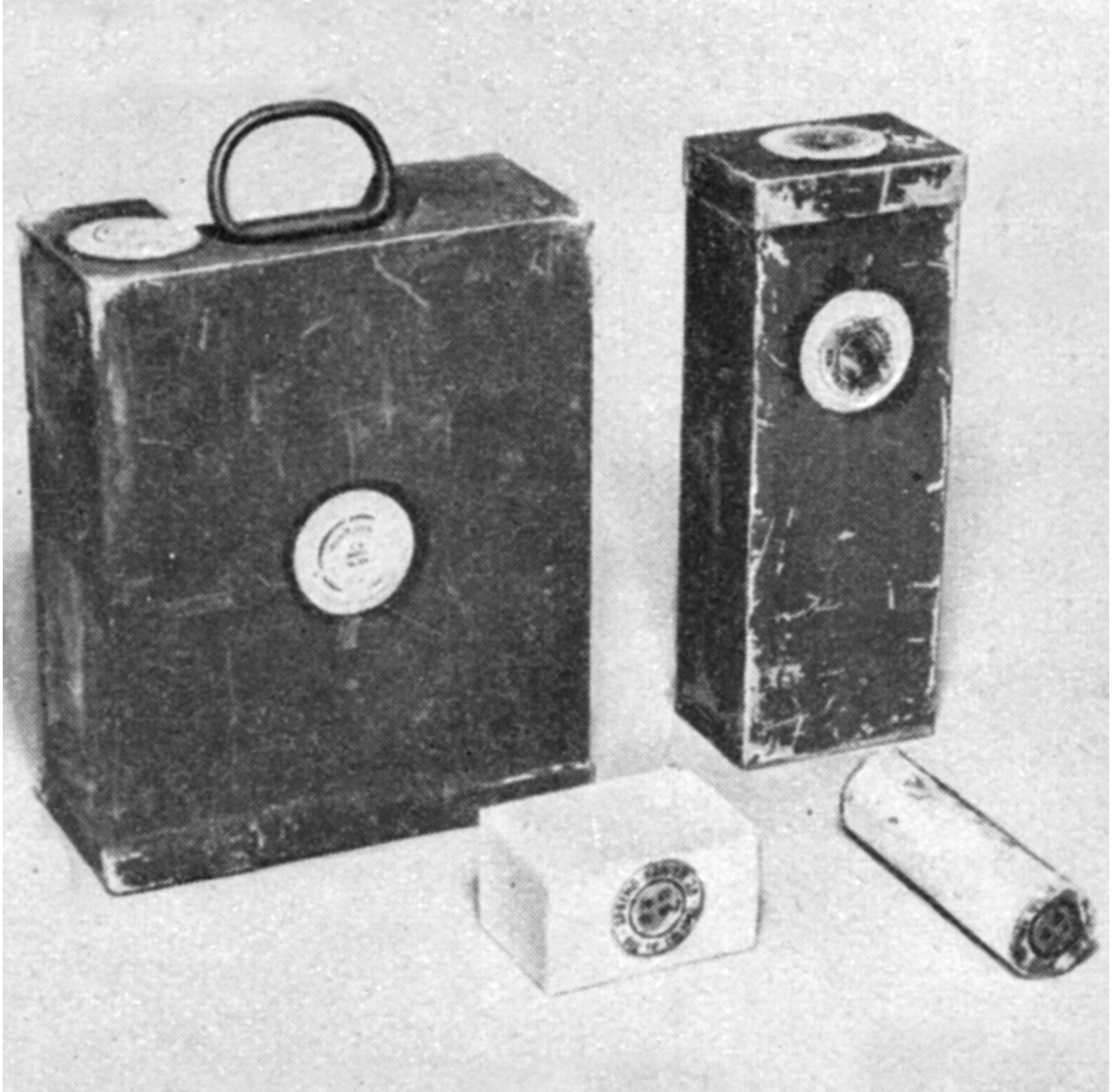


German anti-tank mines, (clockwise from top left): T-Mine 35; T-Mine 35 Stahl; T-Mine 42 and T-Mine 43.

All of the above could be used individually, or combined with larger charges, to increase the explosive impact.

All the above weapons and devices were available throughout the war and were used by German tank-destruction teams: these brave soldiers had to work quickly, but were in constant danger of attack as enemy tanks were usually escorted by infantry. Soviet tanks were also fitted with ports to allow the crew to open fire with a close-defence machine gun or pistol. Consequently, German tank-destruction teams received very high numbers of casualties.

In a number of ways the Panzerbüchse (PzB – tank hunting rifle) was the first successful attempt to produce an infantry light anti-tank weapon with an effective range; but armour penetration was limited even after the introduction of more powerful ammunition, (see Chapter 8). However, both the Panzerbüchse and the later *Schießbecher* (rifle grenade device) were regarded as ineffective against modern armour and were superseded in 1943 by the more effective rocket-propelled *Panzerfaust* and *Panzerschreck* shaped-charge weapons.



Explosive devices (clockwise from the top left): Geballte Ladung 3kg; Sprengbüchse 1kg; Sprengkörper 200g and Rohrpatrone 100g.

Technical Changes

8

In August 1940, the world witnessed the defeat of a well-equipped, powerful modern army, which culminated in the capitulation of France. Indeed the speed of the invasion not only surprised the defenders, but also German High Command.

The victory was celebrated in Germany, but the realities of the battlefield were ignored or carefully concealed by the propaganda organization. In Great Britain news broadcasts on radio and articles in newspapers built up the legend of *Blitzkrieg* (Lightning War). Hitler and his cohorts were now convinced that they were military strategists and that German armed forces were invincible.

For the fighting troops including the *Panzerjägertruppen*, the situation was different. Evaluation of experience gained during the French campaign combined with pre-1939 preliminary discussions for a powerful anti-tank defence, identified an urgent requirement for highly-mobile heavier calibre guns.

Time was a crucial factor: the development of a new weapon and finding a production facility with spare capacity in an already overstretched armaments industry was a constant problem. As work to produce the new more powerful 5cm PaK 38 began, so did the argument for an even heavier calibre gun.

The *Panzerjäger* had entered the war armed with the 3.7cm PaK which at the time of its introduction was a modern weapon, but it proved to be ineffective against heavily armoured French tanks; the logical step was to introduce a 5cm weapon. In mid-1940, trials of the new 5cm PaK 38 showed that it had a ballistic performance that could defeat contemporary French and British tanks (a possible exception was the Matilda II), but new tank designs with better armour were being developed.

A posed photograph taken for propaganda purposes: The gunner has remained with the gun to take out an enemy tank at close range; the rest of the crew take cover in a road-side ditch. (Getty)

The situation was also aggravated by the fact that production of the 5cm PaK 38 began very slowly. Only 45 guns had been delivered by August 1940, and by December this number increased to 294; nowhere near enough to replace the 3.7cm PaK.

Possibly the *Panzerjägertruppen* would now regret the decision to introduce the 10.5cm le Fh 18 howitzer rather than a 7.5cm light field gun for the divisional artillery.

In this context it must be recognized that the existing heavy anti-tank weapons, namely the s 10cm K 18 and the 8.8cm FlaK 18, had sufficient armour penetration performance and destruction capabilities. Yet both weapons lacked mobility – a decisive feature for an anti-tank gun, which was starting to be deployed more offensively. A lighter 7.5cm field gun would have solved many of these problems.

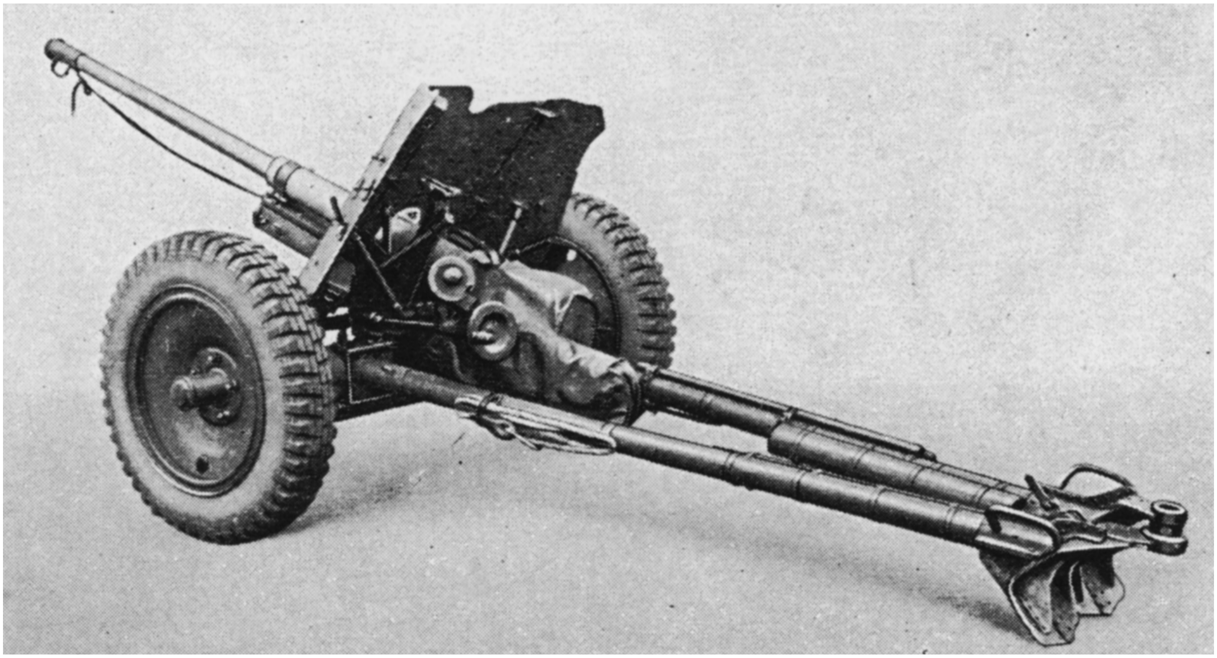
Unlike the German army, the French had large numbers of 75mm *Canon de modèle* 1897 in active service. The weapon which entered service in late 1897 is considered to be the first modern field gun and as was still in front-line use in 1940. However, it remains unknown how often the French army used the gun in anti-tank warfare: French tank destroyer units used the 25mm and 47mm anti-tank guns. However, because the 75mm modèle 1897 was relatively light and had a reasonable performance, those seized during the *Blitzkrieg* were distributed as *Beutegeschütz* (captured gun) to the *Panzerjägertruppen*.

A Technical Solution

In 1903, the German engineer Karl Puff [sic] registered a patent for the conical-bore (squeeze-bore) principal: later known as taper-bore. The technology was not progressed with until the 1920s when an engineer named Gerlich took up the patent. Design and development work continued into the 1930s, culminating in a powerful 7mm anti-tank rifle with a muzzle velocity of 1,800mps.

For the German department responsible for artillery development, a number of challenges arose:

- A quick and effective increase in performance of all existing ordnance, including conventional artillery and anti-tank guns.
- Development of new and better weapons for all services using modern technology.
- All this would require an increase in industrial output and a total awareness of supply problems and, as always, be subject to time pressure.



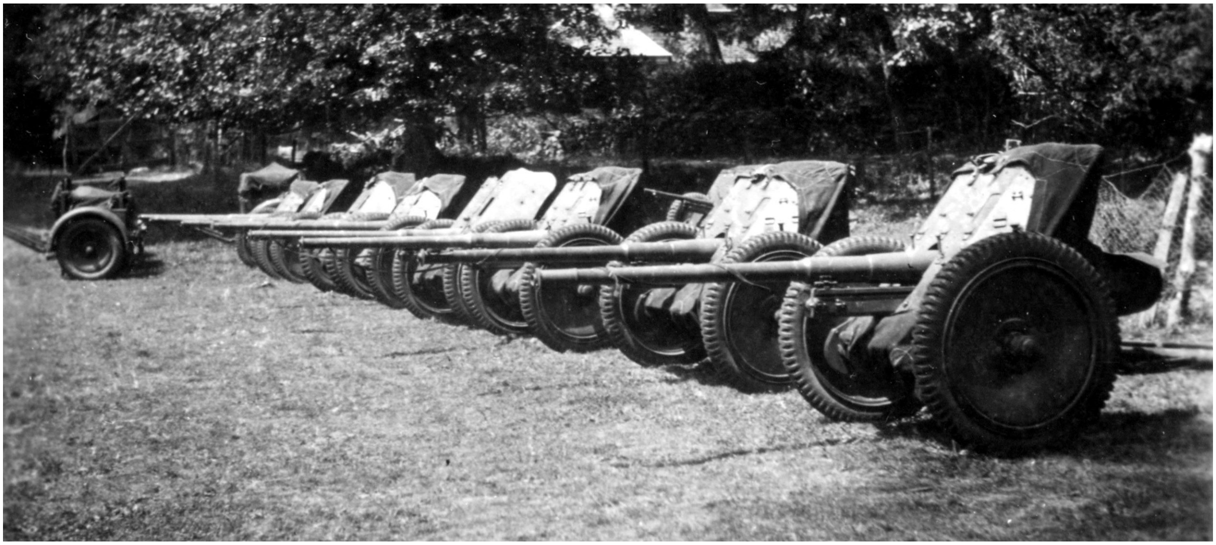
The taper-bore 4.2cm PaK 41 was almost identical to a 3.7cm PaK, the only discernable difference being that it had a longer gun barrel.

On 7 October 1940, the *Waffenkommission der Artillerie* (ordnance commission of the artillery) compiled an interesting report, confirming that research had begun but it would be some time before the first results would be available. The term '*Friedensheer*' (peacetime army) shows that the commission, at that time, did not expect the war to continue:

> I
>
> a.) Within this report the ordnance commission will present proposals for the future equipping of the *Friedensheer*.
> b.) Both manpower and production capacity is limited. When the decision is made to establish new formations, the respective financial resources will have to be provided. So far this has not been the case.
> d.) A great number of new developments will soon be ready for introduction:
> 1.) Taper-bore gun barrels
>
> This type of gun barrel produces a muzzle velocity in excess of 1,000mps while at the same time being of reasonable size and weight. The high velocity will give the following advantages:
>
> – Increase in the performance of anti-tank weapons. Solid-core rounds will have greater armour penetration when compared to conventional armour-piercing rounds. The first trials results are expected in late 1940.
> – Increase in range for guns with a heavier calibre.

> 2.) The discarding sabot shell
> This type of shell uses the complete diameter of the gun barrel. After the sabot falls away the aerodynamically-shaped tungsten round continues on its trajectory with increased velocity. Discarding sabot-type shells can be stabilized by induced spin or by folding fins. This principle will be used to:
>
> – Increase the firing range
> – Increase the penetration of armour
> – Increase the penetration of concrete
>
> 5.) Shaped-charge shells
> A significant improvement in armour penetration is expected for the future. At the moment the standard Panzergranate with high impact velocity is superior to the low-impact velocity shaped-charge round.
>
> Summary
> The result of these trials cannot not be predicted; it is assumed that only one direction of development, especially with the shaped-charge weapons, will bring results that will fundamentally influence the entire ordnance question. All developments must be brought forward, since foreign countries are working on similar projects.

The report indicates that the Germans had decided to use their skills with ballistics, to keep the usage of expensive and rare raw materials (tungsten) to a minimum. All three technical developments listed were about to be realized.


A line of recently delivered 4.2cm PaK 41 guns at the garrison of an anti-tank unit. In the background is a *Sonderanhänger* (SdAnh – special-purpose trailer) 32 ammunition trailer.

The ballistic performance of a 5cm PaK 38 could be improved by firing the 5cm PzGr 40, a hard metal-cored round. The improved ammunition was delivered to anti-tank units before the invasion of Russia. Note that the gun is fitted with a two-layer armoured gun shield.

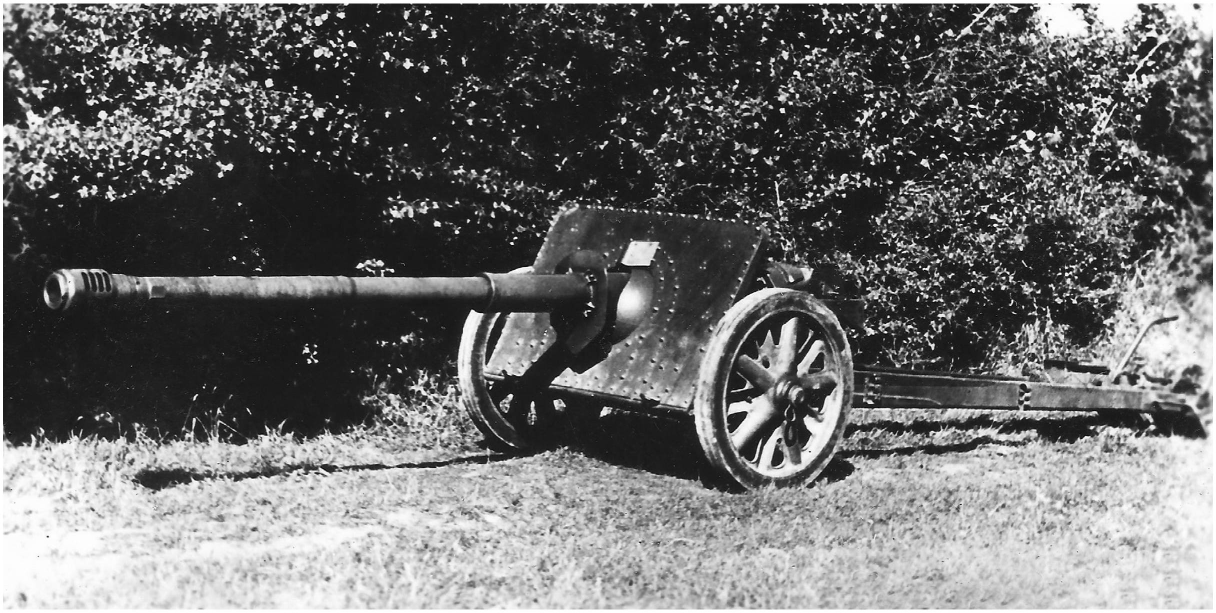
However, the process of development, evaluation and production of the new ordnance would be a lengthy process. With this in mind, and as an interim measure, the ordnance bureau decided to introduce improved ammunition for existing anti-tank guns:

- Hartkerngeschoss – solid-core, high-velocity, armour-piercing (HVAP).
- Hohlladungsgeschoss – shaped-charge.

This measure was taken as it would increase the service life of the weapon in current use with *Panzerwaffe* and *Panzerjäger* units.

PzGr 40 Hartkerngeschoss

The standard armour-piercing shell was a hardened metal round, usually topped with a piercing cap to dampen the initial impact. To improve performance, a second ballistic cap was added and also an incendiary or high-explosive (HE) charge was added at the base of the shell, to enhance destructive power. The Panzergranate (PzGr) 39 was an excellent armour-piercing capped ballistic capped (APCBC) shell.



The 7.5cm PaK 41 was among the most effective anti-tank weapons of World War II, but was different from all other German designs. The gun cradle, which covered the rear half of the barrel, was positioned in a special ball mounting attached to the gun shield. The massive shield formed the carriage, to which the split trails were attached.

In autumn 1941, a greatly improved type of shell was developed and introduced. The Hartkerngeschoss was a high-velocity armour-piercing (HVAP) shell which had a sub-calibre tungsten carbide core. A soft aluminium alloy was used to surround the brittle tungsten core to prevent it from shattering as it hit the target. Due to being relatively lightweight (see table), the round reached a higher muzzle velocity, and this resulted in a considerable increase in armour penetration. However, the effective range was shorter than a standard armour-piercing round.

This new round was designated Panzergranate (PzGr) 40, and went into production before the launch of *Unternehmen* Barbarossa. The following the HVAP rounds were available in December 1941, and more were being developed:

- 2cm PzGr 40 for 2cm KwK and FlaK 30/38
- 3.7cm PzGr 40 for 3.7cm PaK and KwK
- 3.7cm PzGr 40/37(t) for 3.7cm PaK 37(t)
- 4.7cm PzGr 40 for 4.7cm PaK(t)
- 5cm PzGr 40 for both 5cm PaK 38 and 5cm KwK (L/42)*

[*The PaK 38 L/60 and the 5cm KwK L/42 had different length cartridges.]

A comparison of ballistic data between the standard armour-piercing PzGr 39 and the high-velocity armour-piercing PzGr 40 shows some peculiarities. The conventional PzGr 39 had far weaker armour penetration, but was effective over a wider selection of ranges. Also it had a lessened drop in performance at normal combat range. While the 5cm PzGr 39 lost approximately 50 per cent of its penetration performance over ranges from 100 to 1,500m, the PzGr 40 had the same drop, but this was between 100 and 500m. The only available official performances sheets give no penetration data for ranges over 500m. In conclusion, it appears that the performance of the tungsten-carbide round decreased dramatically as the range increased.

This is confirmed by a report published by the *Allgemeines Heeresamt* (General Army Office) on 22 May 1941:

> As with the 3.7cm and 5cm PaK and KwK, the ordnance department developed a HVAP round for the 4.7cm PaK(t), which will be used for defeating tanks at combat ranges below 500m. The principal layout of the projectile is identical to that of the 3.7cm PzGrPatr 40 and 5cm PzGr 40.

This appears to refer to all guns firing the PzGr 40, except the 8.8cm FlaK 18, 36 and 37, and also the various types of long-barrelled 7.5cm and 7.62cm tank and in particular those anti-tank guns introduced in 1942. However, the 8.8cm PzGr 40 presents a somewhat peculiar picture. Those data sheets which are available give no figures for ranges over 2,000m – perhaps penetration was not observed at that range.

PzGr 40 - Penetration Data

		Projectile weight	Muzzle velocity	Penetration at 100m	Penetration at 500m	Penetration at 1000m	Penetration at 1500m
2cm KwK/FlaK	PzGr	148g	780mps	n/a	13mm	0	0
	PzGr 40	100g	1,050mps	n/a	15mm	0	0
3.7cm PaK	PzGr	685g	745mps	35mm	29mm	22mm	20mm
	PzGr 40	355g	1020mps	64mm	37mm	0	0
3.7cm PaK(t)	PzGr	815g	750mps	41mm	33mm	27mm	24mm
	PzGr 40	368g	1,040mps	64mm	33mm	0	0
5cm PaK 38	PzGr 39	2006g	835mps	69mm	59mm	48mm	38mm
	PzGr 40	900g	1,190m/ps	130mm	74mm	0	0
8.8cm FlaK 36	PzGr	10,200g	773mps	118mm	111mm	100mm	92mm
	PzGr 40	7,000g	950mps	170mm	158mm	140mm	0

at 60° angle of impact
0 = no penetration
n/a = data not available

A defensive emplacement at Fort Eban-Emael has been penetrated by a Hohlladung placed by *Fallschirmjäger* during their assault on 10 May 1940. The weapon was also successfully against armoured cupolas during their attack.

In a pamphlet dated April 1944, there is a *Panzerbeschusstafel* (tank destruction table) which shows that an 8.8cm FlaK firing the PzGr 40 could destroy all types of enemy tank at 2,000m range. This concurs with many after action-reports delivered in 1942 and 1943.

Development and introduction of the PzGr 40 for the different tank and anti-tank guns was an important step to in maintaining superior weapons technology. The fact that these new rounds could be fired from existing weapons was very important, as was the speed of introduction into service.

However, the availability of these high-performance shells depended on the supply of tungsten, a fact that would considerably affect the usage of PzGr 40.

Shaped-charge Round

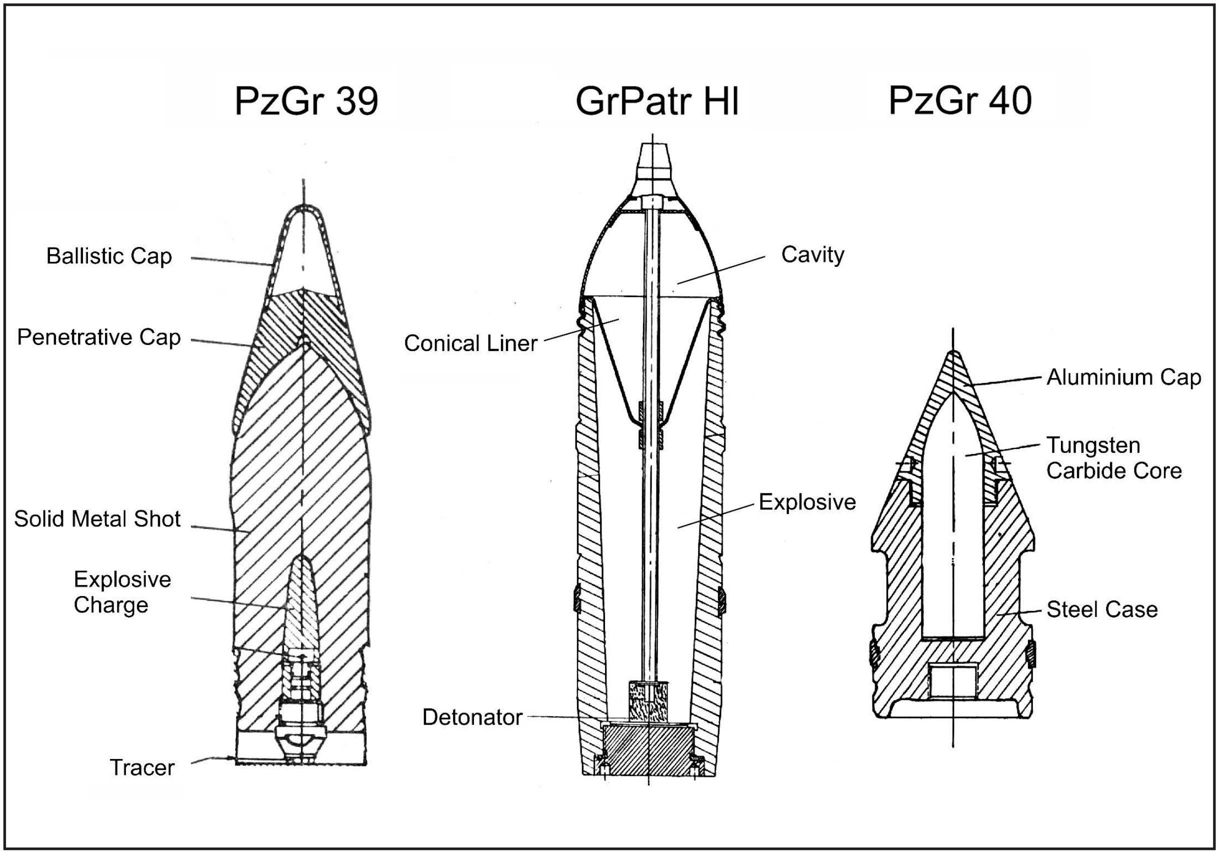
The Hohlladung (Hl – shaped or hollow charge) principle was first mentioned at the end of the 18th century. Some 100 years later, the

American chemist Charles Edward Munroe discovered what became known as the Munroe effect; the forerunner of the hollow charge. The term hollow or shaped charge indicates that the geometrical shape of an explosive device could increase penetration. The weapon developed by the Germans had an empty conical space at the forward end which directed the explosive force and concentrated it on a small area. The resulting jet of ultra-high temperature gas was able to penetrate even the strongest armour plate.

Shaped charges were first used successfully by German *Fallschirmjäger* when they attacked and captured Fort Eben Emael on 10 May 1940.

Hollow-charge technology proved to be ideal for guns which had a comparatively low muzzle velocity. A fine example was the 7.5cm *Kampfwagenkanone* (KwK) L/24 which armed in early versions of the PzKpfw IV and *Sturmgeschütz*. In late 1941, the 7.5cm GrPatr 38 (Hl) was supplied to tank units using the 7.5cm KwK L/24. Later the same technology would be used to develop ammunition for other tank and anti-tank guns. The hollow-charge round was never produced for smaller calibre guns.

The standard PzGr 39 compared to GrPatr Hl and PzGr 40 armour-piercing rounds.


PzGr 39
GrPatr Hl
PzGr 40
Ballistic Cap
Penetrative Cap
Solid Metal Shot
Explosive Charge
Tracer
Cavity
Conical Liner
Explosive
Detonator
Aluminium Cap
Tungsten Carbide Core
Steel Case

Taper Bore

By end of the 1930s, another type of sophisticated technology became available; the Gerlich cone-bore principle. This somewhat odd design had a slightly tapered barrel which had a significantly tapering bore. The shell, fitted to a mild steel cartridge, was forced up the barrel by a powerful propellant, leaving the muzzle at very high velocity.

As with the PzGr 40, it was a sub-calibre shell with the core made from tungsten carbide. The shell was fitted with two soft metal bands which, when fired, pressed onto the tungsten core, resulting in a higher velocity. Although armour penetration was relatively improved, a number of disadvantages were identified:

- Standard calibre high-explosive rounds could not be fired from the tapered barrel and sub-calibre high-explosive rounds had a comparatively low impact.
- Stabilization of the shell during the flight was poor.
- The service life of a barrel was significantly decreased to some 500 rounds.

2.8cm PzB 41

The first German ordnance built using the Gerlich principle was designed to meet a *Waffenamt* requirement for a light and effective anti-tank weapon; a taper-bore gun appeared to be the ideal solution. Mauser Werke was contracted to build the gun and had delivered some 2,700 when the war ended.

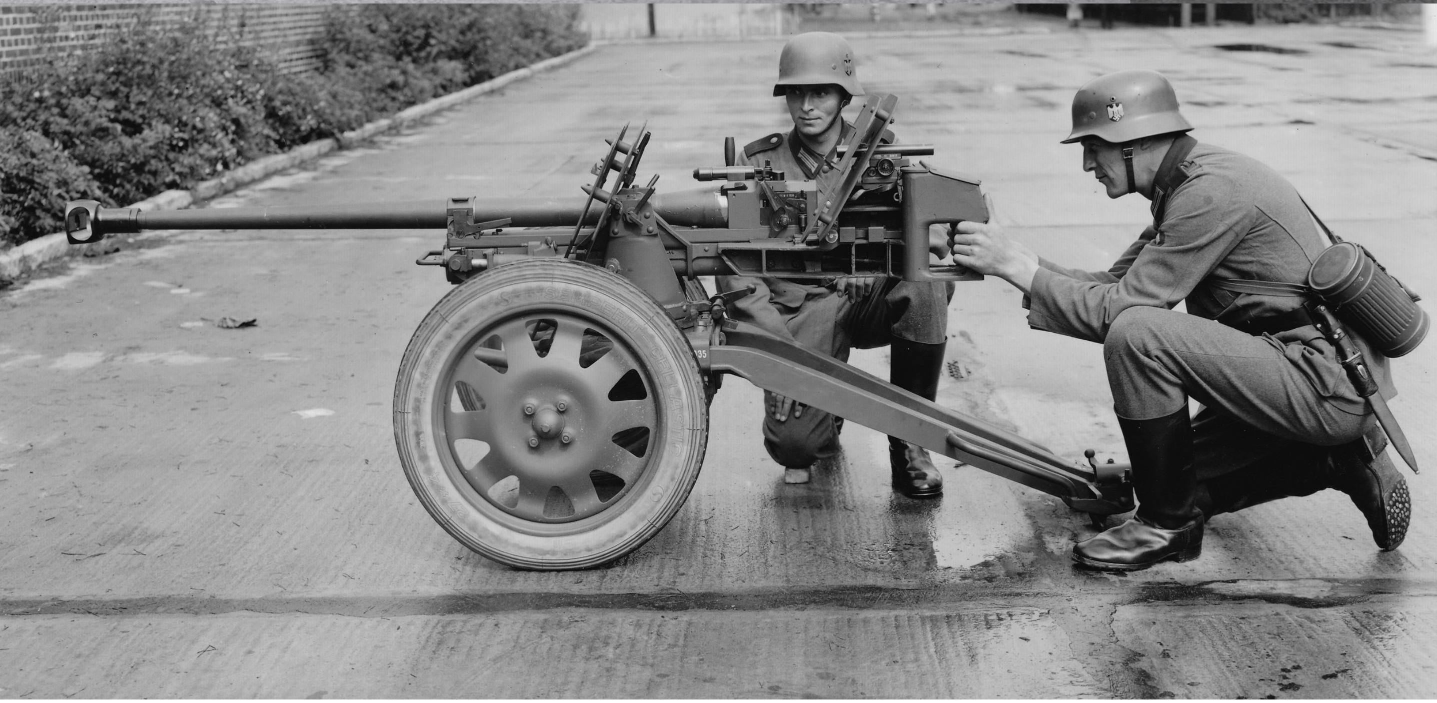
In June/July 1940, the 2.8cm heavy Panzerbüchse (s PzB) 41 entered service and appeared to fulfill all requirements.

At approximately half the weight (standard mounting) of a 3.7cm PaK, the gun was light enough to be moved by the crew, even over rough terrain. This was made easier when a *leichte Feldlafette* (light field carriage) became available. However, a special trailer was developed for use with motor transport. For special formations (paratroops, mountain troops), the gun could be dismantled and carried over uneven terrain, or loaded on a pack animal for longer distances.

The gun fired two types of round:

- 2.8cm PzGr 41 for attacking a tank
- 2.8cm SprGr 41 to attack soft-skinned and lightly-armoured vehicles.

The technical manual D 164/1 published in July 1940 notes:



The 2.8cm heavy Panzerbüchse (s PzB) 41 was mounted on a field carriage,which could be pulled by manpower or by horses or a motor vehicle.

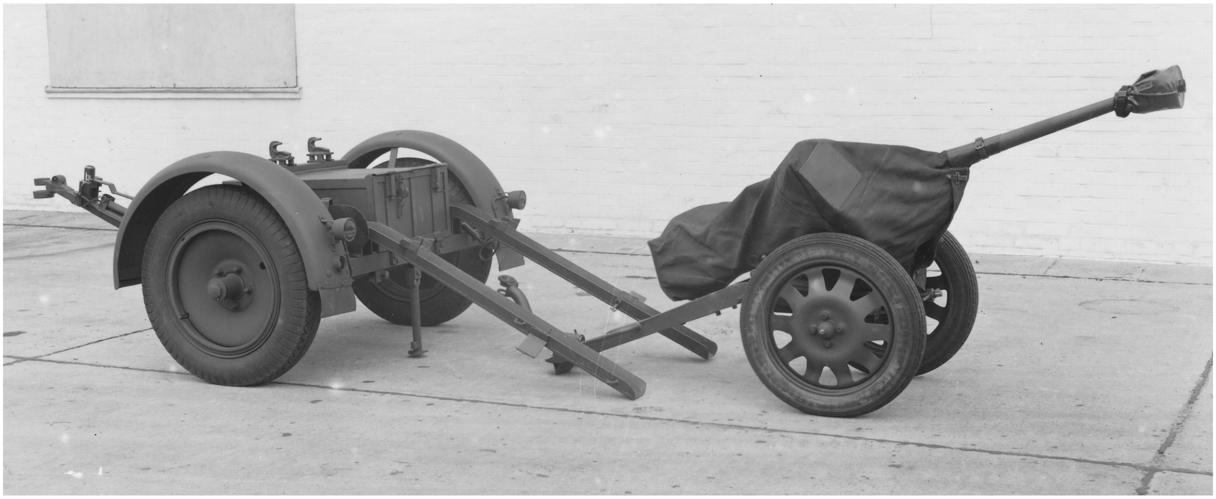
> The 2.8cm s PzB 41 is an infantry weapon intended to be deployed in the frontline to defeat armoured targets. Due to the high muzzle velocity it is unnecessary to use any deflection at ranges less than 400m.

The training pamphlet continues:

> Due to its high muzzle velocity, the s PzB 41 is especially suited to defeating armoured vehicles and other targets behind cover at the following ranges:-
> - Light tanks at up to 300m; medium tanks at up to 200m and heavy tanks up to 100m.
> - Fire at medium range against the side armour of a heavy tank is possible with good results.
>
> The s PzB 41 is superior to the 3.7cm PaK even when firing PzGr 40. Due to its high mobility and low profile the deployment within the *Schützenkompanie* [rifle company] is especially promising.
>
> Infantry targets (machine-gun positions, observation posts and bunkers) can be defeated with high-explosive shells at ranges of 800m.

The new 2.8cm sPzB 41 guns were issued to:

- The *Infanterie-Bataillonen* [infantry battalions] and *Kradschützen-Abteilungen* [motor-cycle battalions] of the *Infanterie-Divisionen* (mot) [motorized infantry divisions].



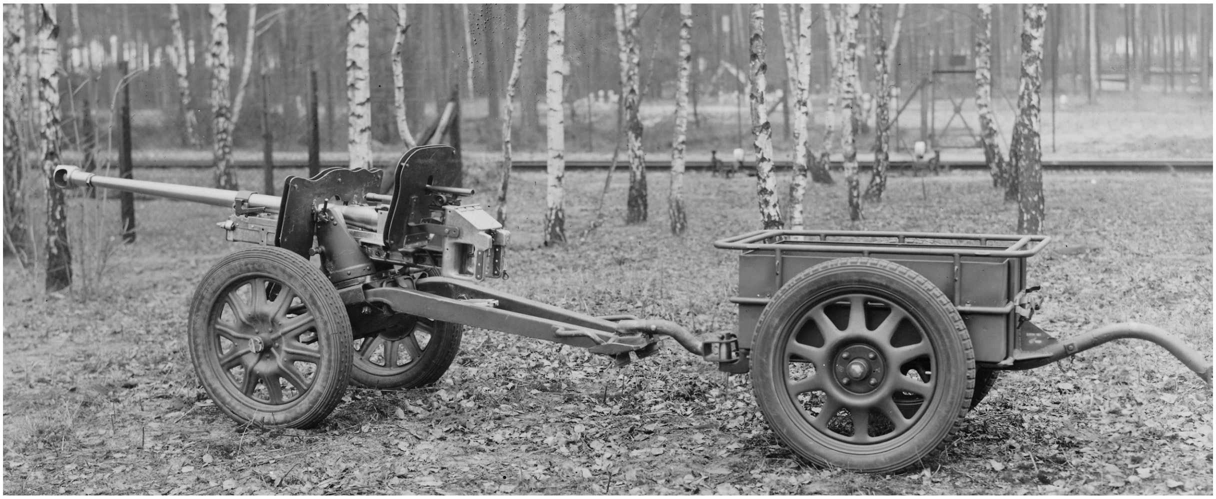
The 2.8cm s PzB 41 on field carriage could be carried on an SdAnh 32 ammunition trailer and towed by a light field car or a standard light truck and also an SdKfz 10 half-track vehicle.

– Also to the *Panzergrenadier-Abteilungen* [motorized infantry battalions], *Kradschützen-Abteilungen* [motor-cycle battalions] and *Panzeraufklärer-Abteilungen* [amoured reconnaissance battalions] of the Panzer divisions.

Apparently the weapon was issued in the first instance to subunits where the light weight of the gun was an advantage; attached anti-tank units remained armed with the 3.7cm and 5cm guns. Unfortunately, military files do not confirm whether standard infantry divisions were issued with the 2.8cm s PzB 41. Production began at a slow pace, which meant that only a limited number of units received this weapon.

2.8cm s PzB 41, Data

Calibre	2.8cm tapering to 2cm
Barrel length	1,700mm = L/61.2
Maximum range	500m (max useful range)
Muzzle velocity	1,200mps
Side traverse	360°
Elevation range	-15 to +25°
Rate of fire	10 to 12rpm
Weight in firing position, standard mount	223kg with wheels 162kg without wheels
Weight in firing position light field mount	147kg with wheels 137kg without wheels
Armour penetration at 100m	60mm
Armour penetration at 500m	40mm
Armour penetration at 1,000m	22.5mm



The 2.8cm s PzB 41 on a standard field carriage could be attached to a *Infanteriekarren* (infantry cart) 8.

The small size and light weight of the gun made it an ideal weapon to mount on a motor vehicle or halftrack.

4.2cm PaK 41

During 1941, another taper-barrel weapon was ordered into production. Externally, the gun was almost identical to a 3.7cm PaK. Indeed the new barrel assembly was simply fitted on an existing split-trail mount, but with improved swing axles. Production of the new gun, initially designated PaK 2472 (K-Rohr), began in late 1941.

A memorandum from the *Waffenamt*, dated 18 September 1941 noted:

> Subject: PaK 2472 (K-Rohr)
>
> 1.Stab Rüstung [arms department] has been ordered to limit production to 300 units, and authorized to supply 20,000 armour-piercing and 40,000 high-explosive shells. As for delivery; 2, XI.Fliegerkorps asked to be issued with 140 units and 72,000 armour-piercing and 48,000 high-explosive shells by the spring of 1942.
>
> The current position is as follows:
>
> 1) Ordnance:
> Four 4.2cm PaK have been issued for troop trials. Beginning in September, 30 units will be produced monthly and production is expected to increase in January 1942.
>
> 2) Ammunition:
> The ordnance department has requested the production of a further 140 guns along with 72,000 armour-piercing and 18,000 high-explosive rounds.

> The *Reichsluftfahrtministerium* [RLM – ministry of aviation] must be urged to deliver the necessary amounts of tungsten and aluminium.

Production ran from late 1941 to May 1942, and *Waffenamt* statistics show that a total of 286 were produced, but due to some discrepancies in the calculations, the actual number was 306.

Some 110 of the type were issued to *Panzerjäger* units in the *Luftwaffe* – airborne and field units. The remaining guns were issued to a number of unspecified units, which included Waffen-SS and mountain troops.

4.2cm PaK 41, Data

Calibre	4.03cm tapering to 2.9cm
Barrel length	2,250mm = L/55.8
Maximum range	7,000m
Muzzle velocity	1,300mps
Side traverse	60°
Elevation range	-8 to +25°
Rate of fire	10 to 12rpm
Weight in firing position,	560kg
Armour penetration at 100m	101mm
Armour penetration at 500m	67mm
Armour penetration at 1,000m	40mm

7.5cm PaK 41

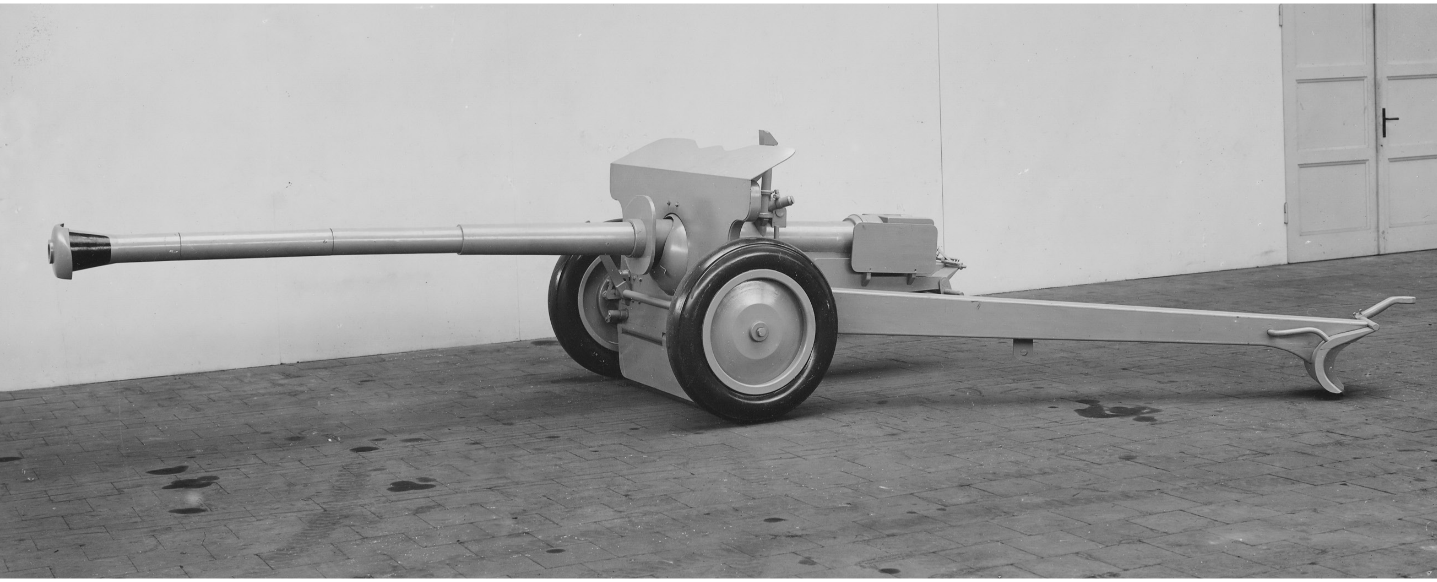
This technically most impressive gun was initially designated the 7.5cm PaK 44. Krupp was responsible for the design and production of the gun within certain criteria:

- Safe penetration of 100mm at 1,000m at 60° angle of impact.
- A weight as low as possible to enable a crew to manually change position.

The design of the gun was unconventional; the actual carriage was the double gun shield. The gun barrel was positioned in a jacket mount, which fitted through a slot in the gun shield. The bearings for the axle were also fixed to the gun shield. A number of brackets supported the two split trails. During firing, the axle springs had to be removed. This mechanical layout saved weight and reduced the profile of the gun.

The PaK 41 fired three types of ammunition:

- 7.5cm PzGr 41 HK: a tungsten core (APCNR – armour-piercing composite non-rigid).



The wooden mock-up for the prototype of the 7.5cm PaK 41 at the Rheinmetall factory.

- 7.5cm PzGr 41 W: a hardened-steel core round, due to the shortage of tungsten.
- 7.5cm SprGr 41: high-explosive round.

Both of the initial requirements were fulfilled and somewhat exceeded. Trials showed that the gun had outstanding performance, and a combat weight of 1,250kg was acceptable.

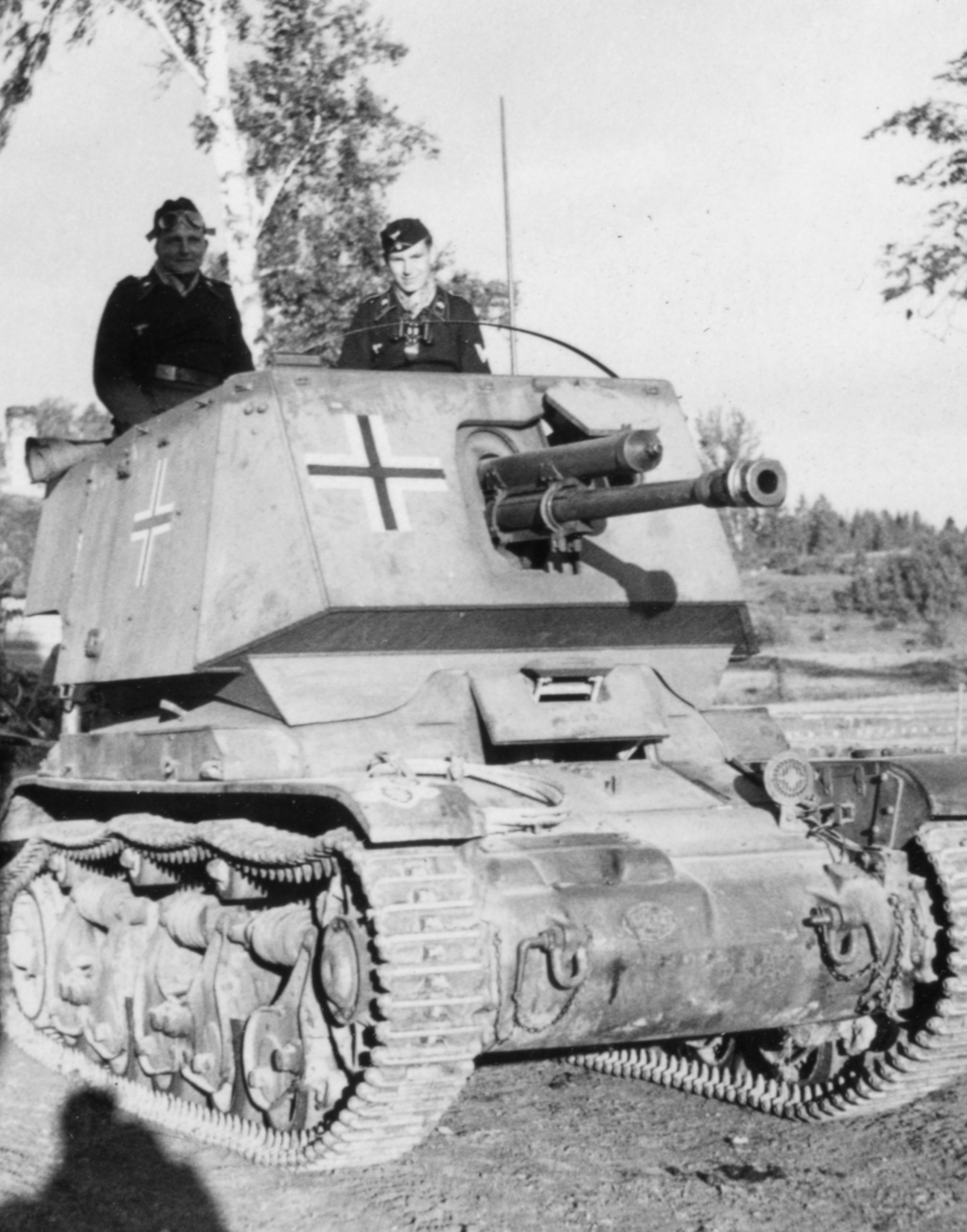
Production began in early 1942 (see next chapter).

7.5cm PaK 41, Data

Calibre	7.5cm tapering to 5.5cm
Barrel length	4,320mm = L/57.6
Maximum range	2,400m
Muzzle velocity	1,260mps
Side traverse	60°
Elevation range	-10° to +18°
Rate of fire	10 to 15rpm
Weight in firing position,	1,380kg with wheels
Armour penetration at 100m	198mm
Armour penetration at 500m	172mm
Armour penetration at 1,000m	140mm

Discarding Sabot Shells

To the knowledge of the author, *Treibspiegelgeschosse* (discarding sabot shell) were not used for German anti-tank guns in World War II.



Preparations for Russia

9

As 1940 came to a close, people in unoccupied Europe remained convinced that further conflict was imminent. After the German lightning defeat of France in July 1940, many thought that Hitler would not rest on his laurels until Great Britain had been neutralized, either by a negotiated (on German terms) peace treaty or by a large-scale sea-borne invasion. But the Battle of Britain, which ended in September 1940, saw the 'mighty' *Luftwaffe* defeated and his plans cancelled.

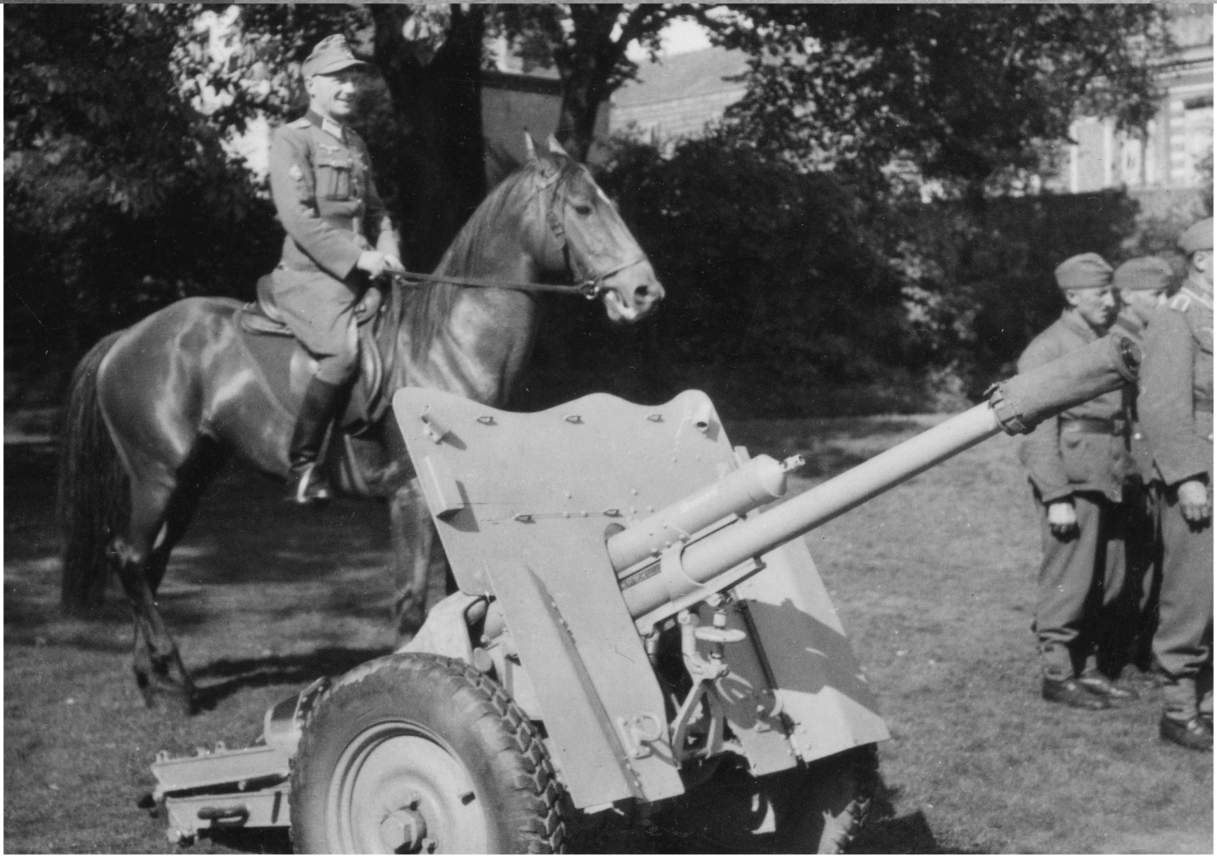
However, Hitler still held on to his old ambitions of winning a war of ideology: paramount was the destruction of Bolshevism to create more living space in the east for his Aryan people. He now began planning another *Blitzkrieg* invasion. On 31 July 1940, Hitler had informed the *Oberkommando der Wehrmacht* (OKW – high command of the armed forces) of his plans to invade Russia in 1941.

On 13 July 1940, the *Organisationsabteilung* ordered the disbandment of 35 divisions, but this was not a dramatic measure to appease the enemy, rather a long-standing plan being implemented. However, at virtually the same time, a number of new divisions were being established in *Wellen* (waves). Also, the OKW ordered that the number of rail and road links to the east must be increased.

In anticipation of the planned operation, the establishment of the 11 waves of infantry divisions was ordered at the end of July 1940, followed by four further waves by May 1941: at the launch of the invasion some 150 infantry and 20 tank divisions would be ready or preparing for combat and transferred to the east.

On 18 December 1940, Hitler issued *Weisung* Nr 21 (directive No 21); the order to begin detailed planning for a rapid invasion of the Soviet Union.

As *Unternehmen* Barbarossa began, three PzJgAbt (559, 561 and 611) had been allocated 4.7cm PaK auf PzKpfw 35(f) self-propelled anti-tank guns to improve German anti-tank defence. However, the guns were built using the French chassis and proved to be unsuitable, and nearly all of those delivered suffered mechanical problems, many of which could not be rectified.



All 3.7cm Pak 37(t) captured (commandeered) from the Czech army were refurbished and issued to the *Panzerjäger* units of infantry divisions stationed in the occupied west, where they replaced the German 3.7cm PaK.

Panzerjägertruppe – shortages

The 3.7cm PaK was still the main weapon of divisional *Panzerjäger* companies and battalions. In May 1940, the performance of the gun was considerably increased by the PzGr 40 tungsten-carbide shell becoming available. Production of the new 5cm PaK 38 was accelerated, but deliveries were slow and approximately 1,000 had been delivered by June 1941.

In this context the stock of ammunition for the various anti-tank guns is interesting:

Ammunition stocks as of 1 June 1941:

PzB 38/39	2,651,800
3.7cm PzGr and SprGr*	19,139,300
3.7cm PzGr 40	938,800
5cm PzGr	522,200
5cm PzGr 40	50,300
3.7cm PzGr 37(t)	1,763,300
3.7cm PzGr 40/37(t)	170,600
4.7cm PzGr and SprGr 36(t)*	72,300

(* Numbers combined for armour-piercing and high-explosive rounds)

The tungsten-carbide core PzGr 40 is new to the table which was published monthly. The same type of high-performance ammunition for the 4.7cm PaK(t) was noted in summer 1941.

On 21 April 1941, the *Oberkommando des Heeres* (OKH – high command of the army) decided:

1) With immediate effect the *Panzerabwehrkanone* will be renamed as *Panzerjägerkanone*: Abbreviated as PaK
2) To allow indentification of differently equipped *Panzerjäger* units, the following designations will be introduced:

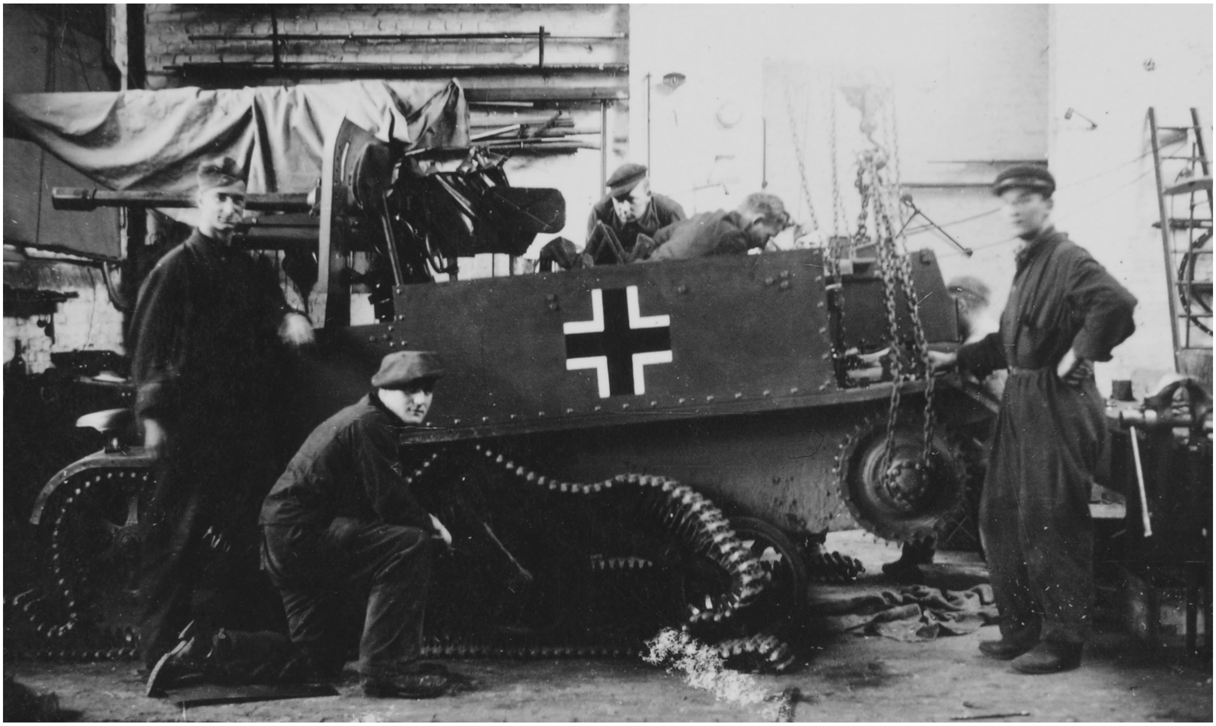
Leichte Panzerjägerkanone (light – le PaK)	up to 3.7cm
Mittlere Panzerjägerkanone (medium – m PaK)	from 3.7 to 7.4cm
Schwere Panzerjägerkanone (heavy – s PaK)	over 7.4cm

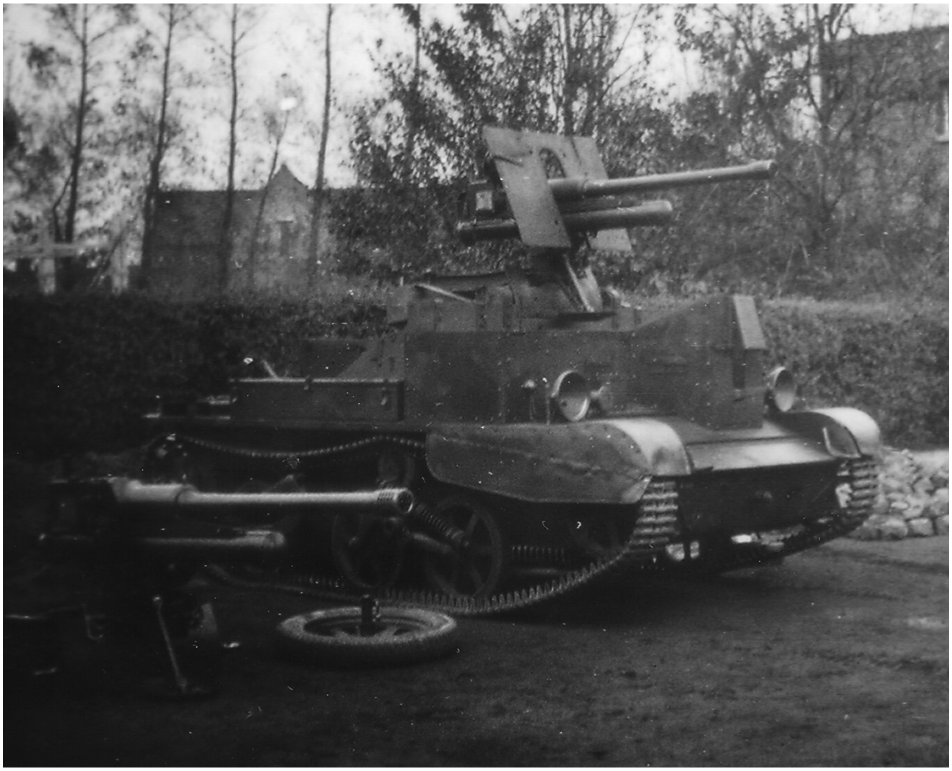
Equipping front-line troops with close-range anti-tank weapons had begun. The man-portable 7.92mm Panzerbüchse (PzB) 38/39 was now in full production and were reaching the battlefront in steadily increasing numbers.

On paper, the situation appeared to be satisfactory; the table provides exact figures for actual stocks of anti-tank weapons during 1941.

However, the German motor industry was unable to produce enough prime movers for newly formed units or to replace combat losses. At first there were sufficient stocks, but the responsible authority totally underestimated the losses due to enemy action. In the second half of 1941, the situation deteriorated even more due to the climatic conditions of the Russian front.

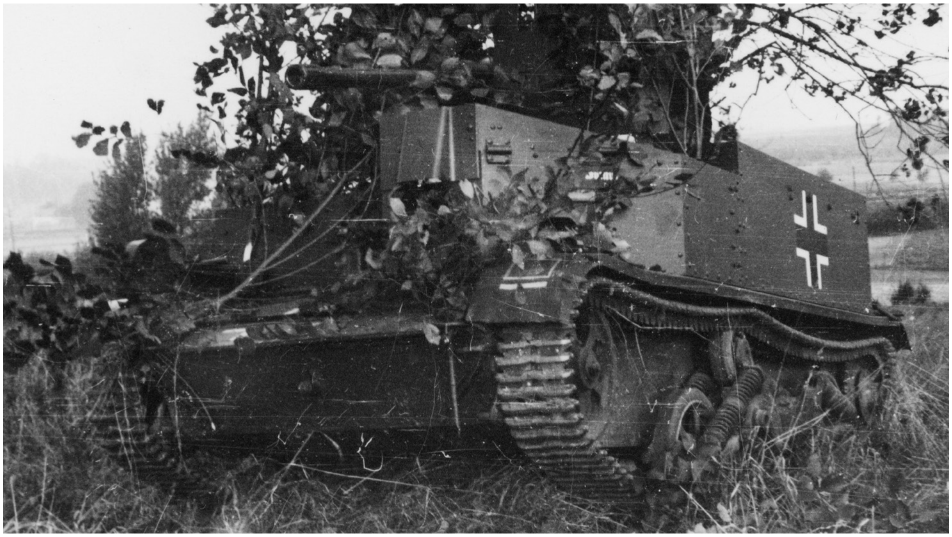
After the end of the French campaign, thousands of motor vehicles became available to the *Wehrmacht*. The Renault-built UE Chenilette, a small armoured tracked infantry carrier, was issued to many *Panzerjäger* units in infantry divisions.





Above: Large numbers of British-built Universal Carriers captured in France were also used by German forces. A number of these were modified to mount a 4.7cm Böhler anti-tank gun: this modified Universal Carrier undergoes maintenance in a German workshop.

Right: A 4.7cm Böhler gun mounted on a Universal Scout Carrier. Most of the modification work was carried out in occupied France, but it is not known how the type was deployed.



A British-built Universal Carrier has been fitted with an Ordnance QF 2-pounder anti-tank gun, possibly captured from British forces at Dunkirk. Note that the tactical sign denotes the vehicle to the 14. Co. of an unknown infantry division. Possibly the Böhler gun version was issued to the same unit.

The situation for the *Panzertruppe* improved as the number of Panzer divisions was nearly doubled for the operation, but this was only achieved by practically halving the number of tanks in each unit. The number of better armed tanks, such as the PzKpfw III (5cm KwK L/42) and the PzKpfw IV (7.5cm KwK L/24), was increased in proportion: a move that was considered to be sufficient.

Captured Equipment

After the invasion of France and long before *Unternehmen* Barbarossa, every effort was being made to increase the number of motor vehicles. The lack of industrial capacity in the Reich forced the German military to collect captured or abandoned arms and vehicles to be used by the *Wehrmacht*.

Much of the equipment captured in France, including the large number of trucks abandoned by the British, were refurbished and delivered to German units to solve the lack of supply and towing vehicles.

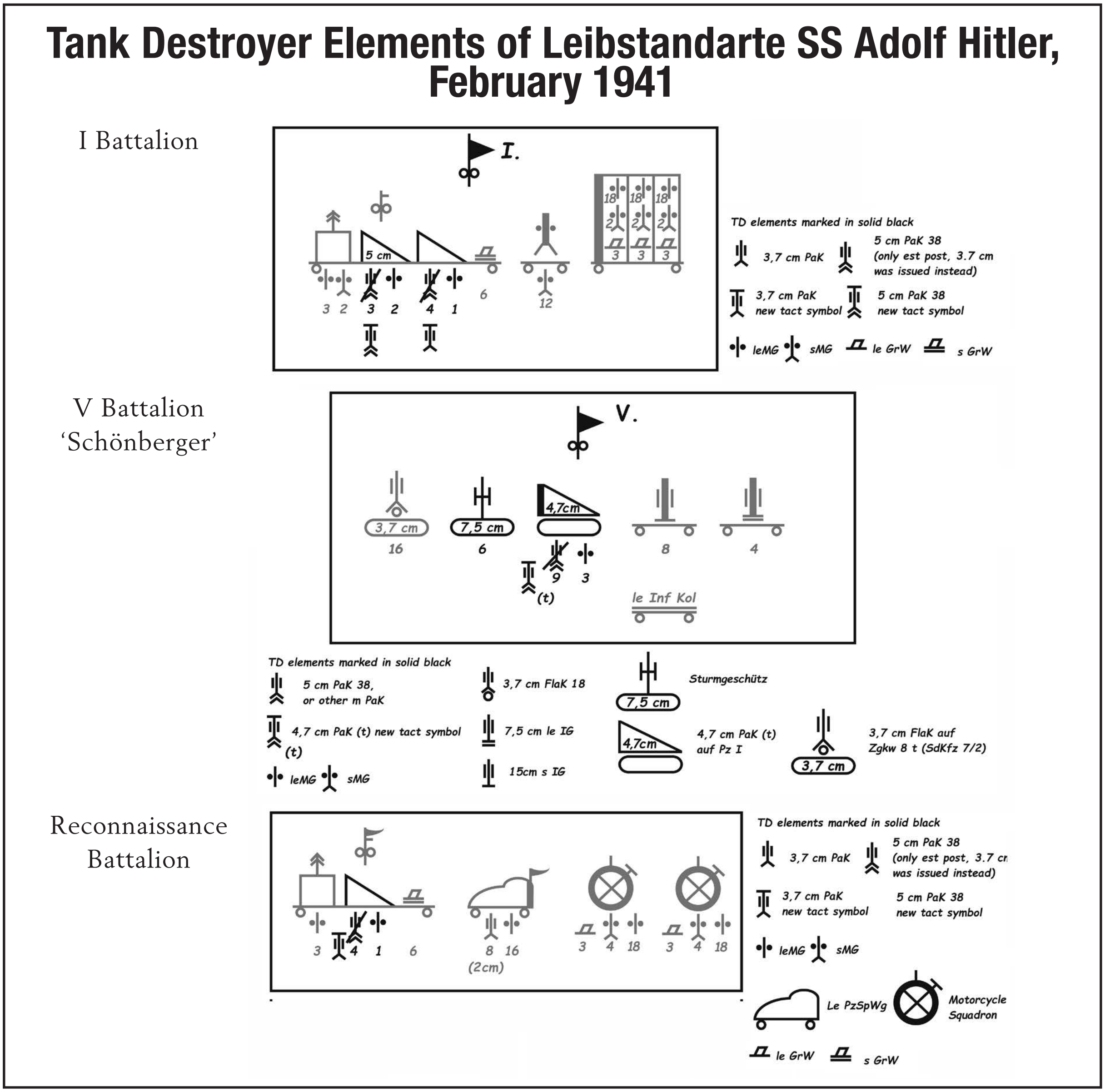
No exact figures remain of what equipment was re-used, but it included:

– Artillery pieces
– Anti-tank guns
– Commercial and cross-country vehicles and trucks
– Prime movers

(This book will deal with only those anti-tank weapons accepted by the German ordnance office. Much of the detail has been gathered from the *Überblick über* *den Rüstungsstand* published monthly by the *Waffenamt* (ordnance office) and a few other reliable sources.)

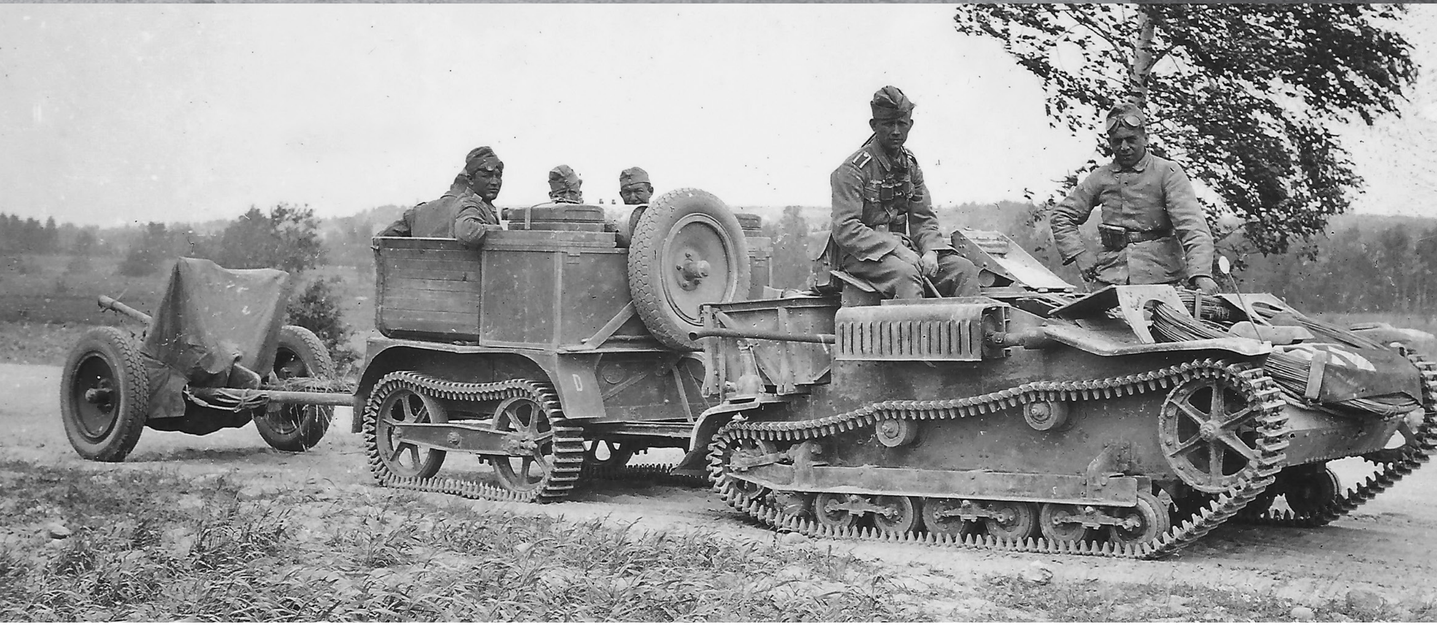
3.7cm PaK 37(t)

By the end of 1940, a total of 1,062 of this Czech-built anti-tank gun had become available and a small number were issued to infantry divisions and Waffen-SS units, possibly for training purposes. Interestingly, the gun could fire the same PzGr 40 (available in mid-1941) as the German 3.7cm PaK. However,



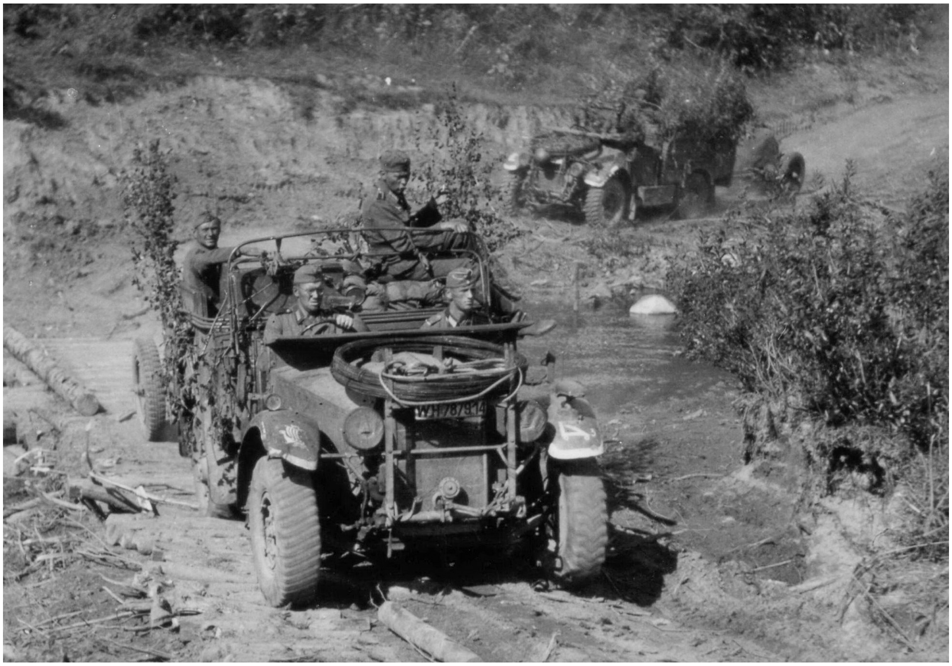
Tank Destroyer Elements of Leibstandarte SS Adolf Hitler, February 1941

I Battalion
I.
5 cm
18 18 18
2 2 2
3 3 3
3 2 3 2 4 1 6
12
TD elements marked in solid black
3,7 cm PaK
5 cm PaK 38 (only est post, 3.7 cm was issued instead)
3,7 cm PaK new tact symbol
5 cm PaK 38 new tact symbol
leMG
sMG
le GrW
s GrW
V Battalion 'Schönberger'
V.
3,7 cm
16
7,5 cm
6
4,7cm
9 3
(t)
8
4
le Inf Kol
TD elements marked in solid black
5 cm PaK 38, or other m PaK
4,7 cm PaK (t) new tact symbol
(t)
leMG
sMG
3,7 cm FlaK 18
7,5 cm le IG
15cm s IG
7,5 cm
Sturmgeschütz
4,7cm
4,7 cm PaK (t) auf Pz I
3,7 cm
3,7 cm FlaK auf Zgkw 8 t (SdKfz 7/2)
Reconnaissance Battalion
3 4 1 6
8 16
(2cm)
3 4 18
3 4 18
TD elements marked in solid black
3,7 cm PaK
5 cm PaK 38 (only est post, 3.7 cm was issued instead)
3,7 cm PaK new tact symbol
5 cm PaK 38 new tact symbol
leMG
sMG
Le PzSpWg
Motorcycle Squadron
le GrW
s GrW



the weapon was removed from statistics published by *Waffenamt* in May, and moved to the appendix, where obsolete equipment was listed. The number of weapons held in stock did not decrease until August, when 349 were issued to army units and another eight to the replacement army. The fact that no figures for losses are shown is due to the fact that 349 guns were supplied to units occupying the Low Countries and France. When the Soviet campaign began, not one of these guns was being used in combat by German forces. In July 1941,

Above: Units were issued with the Renault UE and (whenever available) the tracked trailer. The UE was modified to have a small crew compartment, and a box to carry ammunition. Even a spare tyre for the 3.7cm PaK was carried.



Left: British soft-skinned vehicles were also collected from the battlefields in France and refurbished. The entire PzJgAbt of 110.InfDiv was issued with Morris Commercial light trucks.

an order was issued to retrieve all 3.7cm PaK(t) – including ammunition and accessories – from any army and replacement units equipped with the gun. Most of the remaining 3.7cm PaK 37(t) were destined to be installed in *Festungen* (fortifications), including the Atlantic Wall. Unknown numbers were supplied to allies of Germany as military aid, but many others were scrapped.

4.7cm PaK(ö)

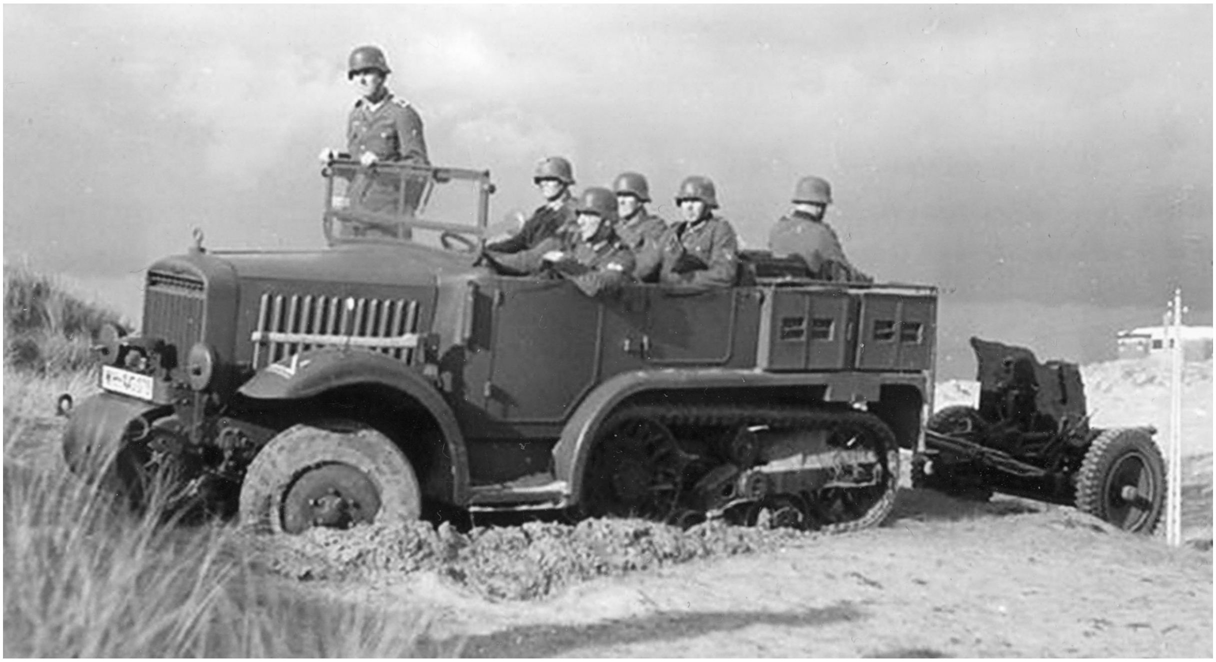
Production of this gun of Austrian origin continued throughout 1940, but monthly output was low. Consequently, as noted in the *Überblick über den Rüstungsstand*, only a relatively small number was supplied to the German army. Production was officially halted in December 1940: in January 1941 it was reported that 472 guns were available. An unknown number were mounted on the chassis of the British-built Universal Carrier for use as a self-propelled anti-tank gun.

Many of these guns were used as defensive weapons in fortifications, and only a relatively small number reached army and Waffen-SS formations.

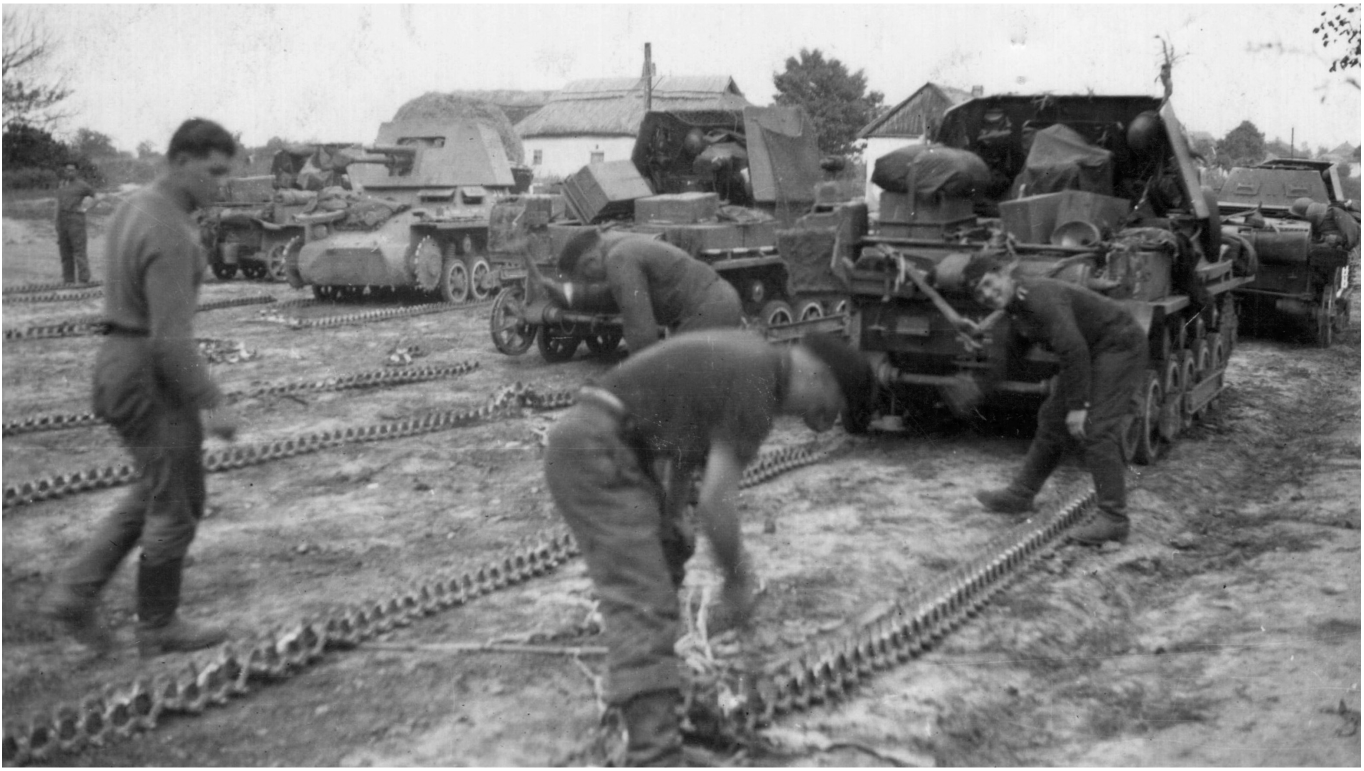
4.7cm PaK(t)

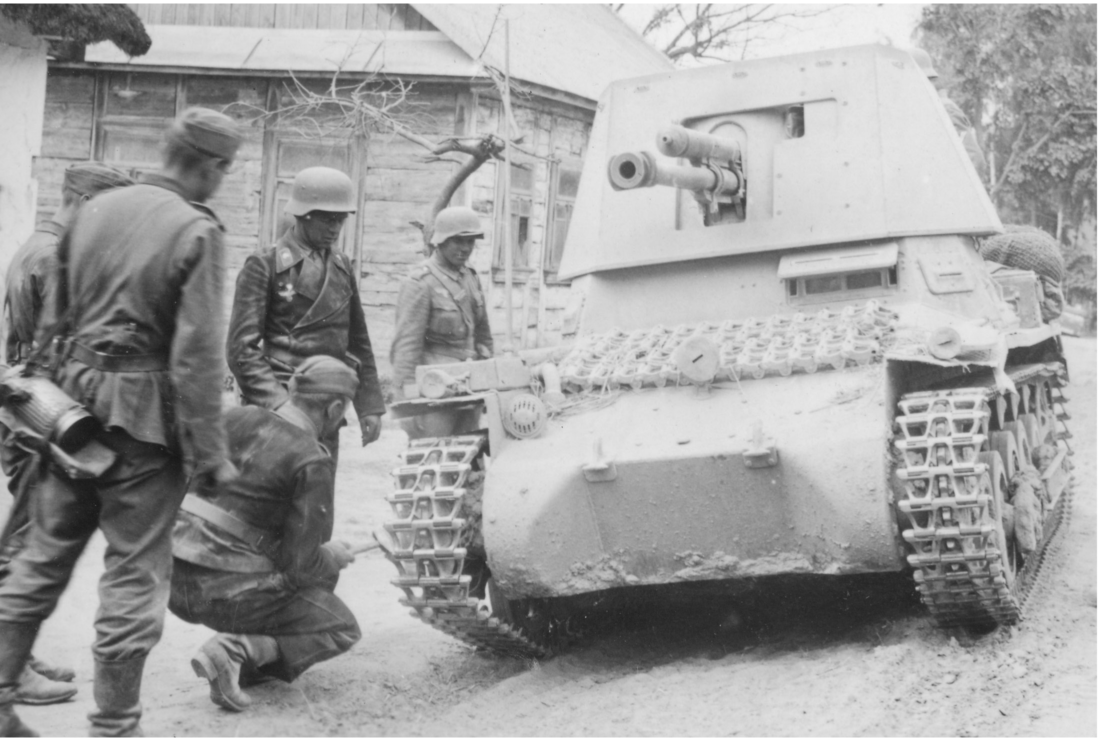
This Czech-built 4.7cm PaK was certainly one of the more important weapons of foreign origin in German service in the early 1940s.

But *Waffenamt* statistics show some anomalies. The first batch of 76 guns (seized from an export order for Yugoslavia) was officially accepted in March



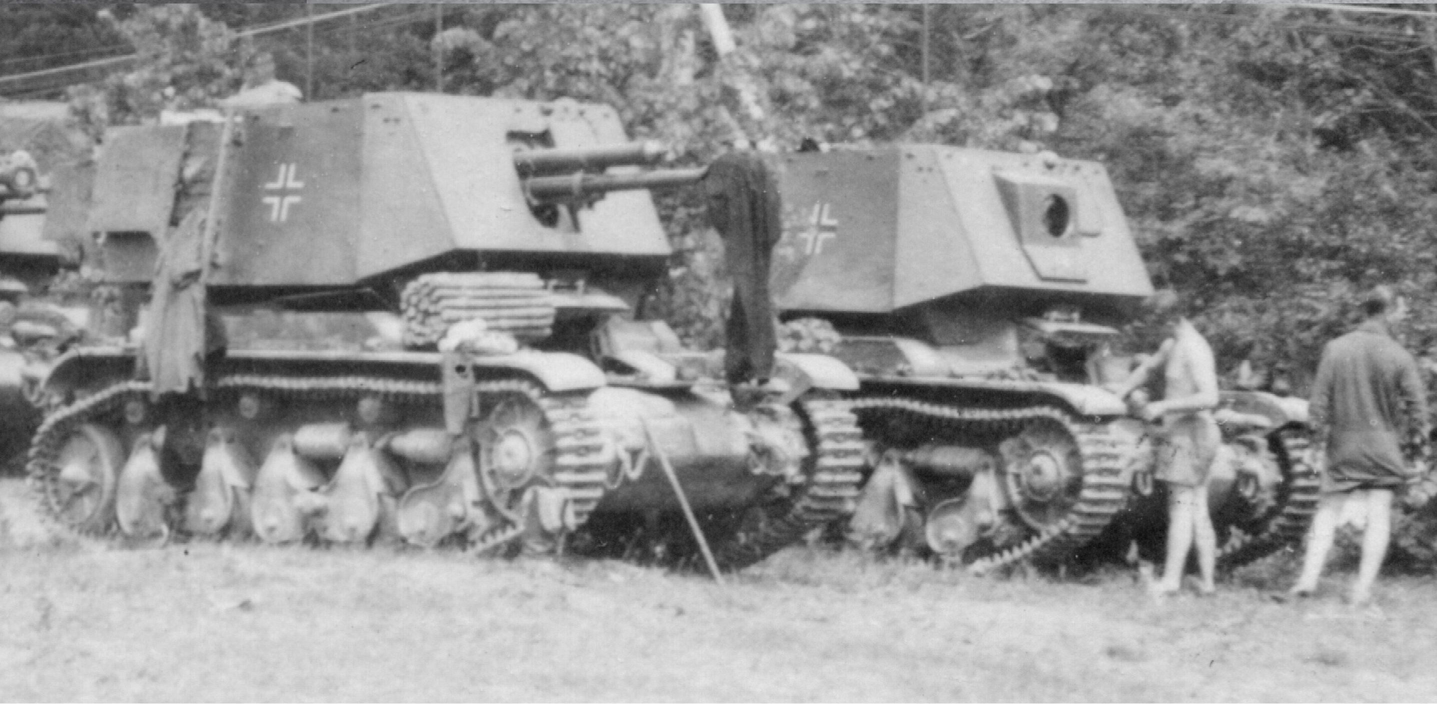
In France, many newly established divisions or those being re-equipped were issued with French-built half-track vehicles as replacements for German types. One such vehicle was the Unic P 107 light half-track gun tractor seen towing a 3.7cm PaK.





Above: A *Panzerjäger* I of a PzJgAbt receiving mechanical checks: The tracks have been removed so that the track pins can be thoroughly examined.

Left: After the end of the French campaign, the number of PzJgAbt issued with *Panzerjäger* I (4.7cm PaK[t]) was increased to six. One (PzJgAbt 605) fought in Africa, and the remaining five were sent to the *Ost* (east) front.



The three units issued with 4.7cm PaK(t) auf PzKpfw 35(f) also received a number of command vehicles (right), which were armed only with a *Maschinengewehr* (MG) 34. However, the French-built chassis were not mechanically sound and therefore were unable to withstand the conditions of the Eastern Front.

1940 under the designation Škoda-built 4.7cm PaK(t). A month later, the statistics tables diverged and a 4.7cm PaK(t) was listed separately. It appears that a decision had been made to establish a stock of 4.7cm PaK(t) to produce a self-propelled anti-tank gun in the future. Another note detailed that a standard 4.7cm PaK K 36(t) was to be mounted on a carriage, fitted with wooden wheels, to be towed by a horse or motor vehicle.

In November 1940, the total stock of 452 was accepted by the *Waffenamt*, and although the production had ceased by this date, in March 1941 the number increased slightly to 490 due to the supply of refurbished guns. The majority of 4.7cm PaK(t) guns were used to construct self-propelled guns.

4.7cm PaK(t) (Sfl) auf PzKpfw I

Before the invasion of France in May 1940, four *Heerestruppen* PzJgAbt had been issued with the new *Panzerjäger* I, mounting the 4.7cm PaK(t),which was at that time the most powerful anti-tank gun in German service. The vehicle proved to be a most valuable asset on the battlefront, and the order was given to increase production. By March 1941, a further 70 had been built.

In October 1940, two further units (PzJgAbt 529 and 605) were equipped with the vehicle.

4.7cm PaK(t) (Sfl) auf PzKpfw 35 R(f)

In December 1941, *Waffenamt* 6 was asked to initiate the design of another type of self-propelled gun mounting the 4.7cm PaK(t). But instead of selecting a chassis of German origin, it used that of the Renault R 35 tank: large numbers had been captured intact and after refurbishment were designated PzKpfw R 35(f) and supplied to the *Panzerwaffe*.

The conversion was comparatively straightforward; a four-sided, open-top armoured superstructure was fitted which gave the crew some protection against infantry fire.

A production order for 200 units was issued and the first vehicles became available in May, the last being delivered in October 1941. Three units issued with the type – PzJgAbt 559, 561 and 611 – were to be formed and established at army troop level.

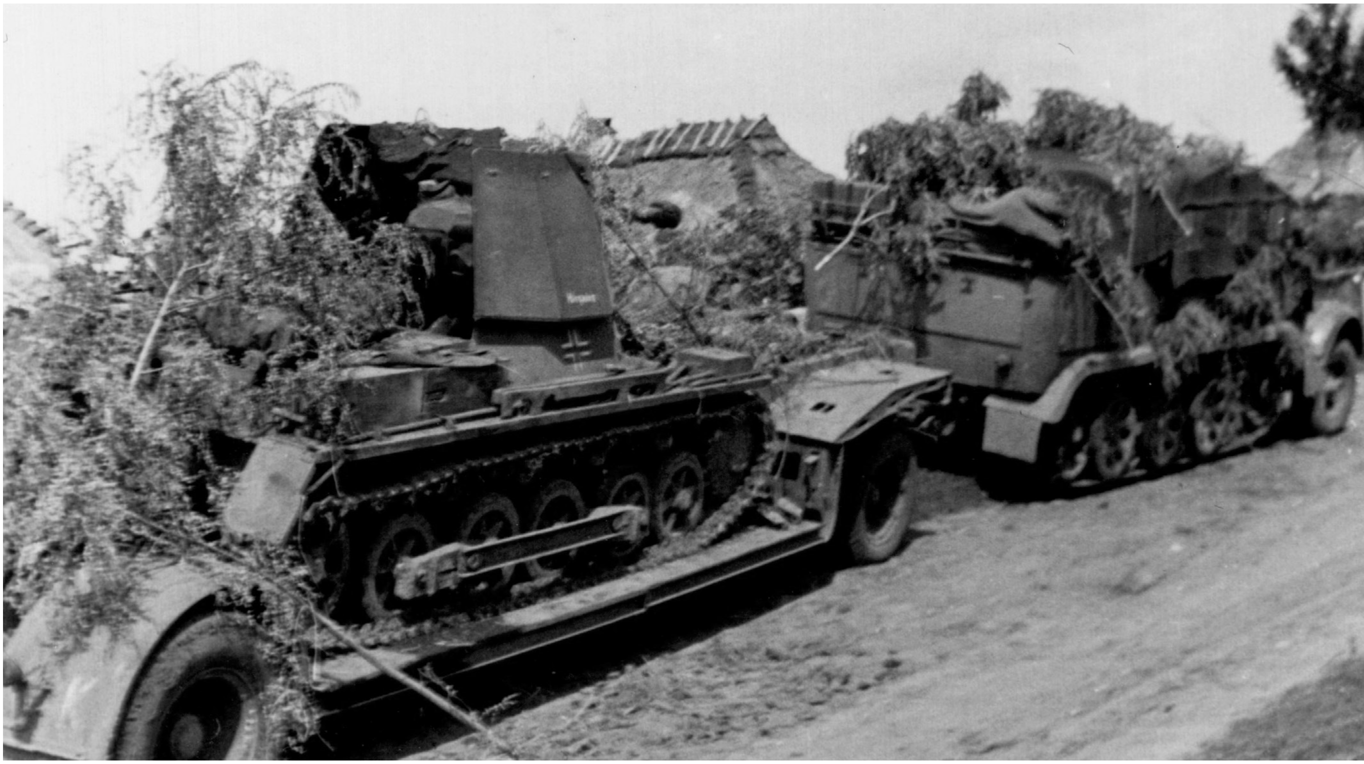
Organizational Adaptions

On 10 October 1940, the *Waffenkommission-Infanterie* (ordnance commission: infantry) defined the changes to be made in *Panzerjäger* detachments.

> 5) Anti-tank weapons
>
> 1) An infantry regiment at present is not equipped with a sufficient number of anti-tank weapons… the numbers have to be increased, as does armour penetration performance. Also high-explosive ammunition must be provided to enable the guns to be used to support an infantry attack.
> 2) The future strength of the InfPzJgKp [infantry anti-tank company] has been defined by the head of the OKW:
>
> Initially twelve 3.7cm PaK and six 5cm PaK
> In future twelve 5cm PaK and six 7.5cm PaK
> It has to be noted:
> A company with 18 anti-tank guns will considerably exceed the usual personnel strength of some 200 men. The 3.7cm PaK has reached the weight limit for a gun crew to manhandle into position. This is impossible for the crews of the 5cm PaK, and also for those of the 7.5cm PaK.

The commission's desire for an improvement in the combat power of the infantry divisions is clearly recognizable.

Only a year after the number of anti-tank guns within the tank destroyer companies was increased from nine to 12, the *Waffenamt* once again demanded more weapons. However, although the above document suggests that this had already been decided, there were not sufficient resources available, and neither would there be in the immediate future.



The workshop section of the PzJgAbt issued with *Panzerjäger* I was also issued with a SdAnh 115 trailer and an SdKfz 7 half-track tractor to recover or transport the self-propelled guns.

The 3.7cm PaK was rated as almost obsolete, so the commission urged that it be replaced by a more powerful gun which had a similar low weight to enable front-line troops to move it easily and, if necessary, use it as an 'assault gun' during an offensive operation.

Furthermore two objectives were discussed: the first was a short-term plan to equip *Panzerjäger* companies with the new 5cm PaK 38, if only in small numbers. The second was a long-term plan linked to the introduction of a 7.5cm anti-tank gun. However it was obvious that in the near future the second option discussed would be impossible to realize.

The document concludes by specifying new structures for infantry formations.

Infantry regiments: The three battalions were to receive three 3.7cm PaK (horse drawn) for their heavy company. A motorized regimental PzJgKp was to be provided with twelve 5cm PaK 38 in four *Zug* (platoon). If the the new gun was not available in sufficient numbers, then 3.7cm Pak were to be allotted. Furthermore provision of a *Sturmgeschütz-Batterie* with six guns was planned.

Motorized (mot) infantry regiment: This is to be provided with three 3.7cm PaK (mot) in its two battalions, an anti-tank gun company with nine self-propelled guns and also a battery of *Sturmgeschütz* (StuG).

Panzer divisions: These are to be subjected to major changes. Instead of two tank regiments, only one is now authorized. Although this practically halves tank strength, since the majority of new tanks entering service are the more powerful PzKpfw III and PzKpfw IV, the combat strength of the division is, in principle, increased.

The *Schützen-Brigade* (rifle brigade) in a Panzer regiment is to have six 3.7cm PaK, and a number of PzB 39 anti-tank rifles. The divisional PzJgAbt is to receive two companies, each with nine 5cm PaK 38, plus one FlaK company with twelve SdKfz 10/4.

The above-mentioned changes for the infantry and tank divisions could not be realized in full. For instance, the allotment of a *Sturmgeschütz* battery for the infantry regiments or self-propelled tank destroyer companies on a regular base was considered to be impossible; these few support units were available, with very few exceptions, only at army group level. A new order of battle was published in February 1941 and this revealed a number of anomalies among the tank destroyer detachments:

Oberst Friedrich-Wilhelm John, the head of WaPrüf 2, gave his answer to the proposals made by the weapon commission as to the tactical value of front-line anti-tank weapons:

> At the moment, the performance of the Panzerbüchse 39 can only be used successfully against a few types of tank. We have to realize that it will soon be outdated as an anti-tank weapon. The infantry on the frontline must have efficient weapons to defeat enemy tanks; this will also have a positive effect on morale. A one-man weapon does not have sufficient penetration power, so we have to provide the front-line troops with heavier weapons manned by several men. The s PzB 41 has completed development, and has twice the performance [penetration] of the PzB 39 and is superior to the 3.7cm PaK at normal combat ranges, even when firing the PzGr 40. Only one horse is required to tow the s PzB 41, it being significantly lighter than the 3.7cm PaK. I regard equipping the (infantry) battalions with the 3.7cm PaK as wrong. Subsequently, I consider it essential for these to be replaced by four s PzB 41.
>
> This would decisively increase the defensive power of the infantry against enemy armour. Also I consider that the suggestion to improve the poor performance of the 3.7cm PaK by simply replacing the barrel with that from the 4.2cm PaK 41 is questionable, as time-consuming trials will have to be undertaken.

The reasons given by *Oberst* John are clear and understandable. The men fighting at the frontline needed small and effective weapons. However, neither the s PzB 41 nor the taper-bore 4.2cm PaK 41 would be available in sufficient numbers. The search for an effective front-line anti-tank weapon had only just begun.

In late 1940, training on the new 5cm PaK 38 in the Reich was intensified. Here a general from the *Wehrmacht* inspects the guns of a Waffen-SS unit. Note the castor wheel is mounted on the split trails of the gun carriage.

Infantry Divisions

All infantry divisions kept to their basic organizational structures in principle. However, due to equipment shortages and other problems, some minor organizational changes were made. This is the reason why each *Welle* (wave) of new divisions was established with different numbers of tank destroyer units.

1.*Welle*

The 35 divisions of the 1.*Welle* were equipped with 36 PaK distributed over the three infantry regiments, and a further 36 in the divisional *Panzerjäger-Abteilung* (tank destroyer battalion). The *Aufklärungs-Abteilung* (reconnaissance battalion) had a further nine PaK.

2.*Welle*

In August 1939 a further wave with 16 divisions was established. In principle, the structures did not change. However, one division was noted as having a combined tank destroyer and reconnaissance battalion, but with a reduced number of anti-tank guns.

3.*Welle*

The 20 divisions of the 3.*Welle* had been raised in September 1939 and manned by veterans of World War I. Most of these divisions were equipped with a reduced number of anti-tank guns in divisional tank destroyer and reconnaissance units (none were battalion size), or a weak combined tank destroyer and reconnaissance battalion.

4.*Welle*

The 14 divisions of the 4.*Welle* (September 1939) were equipped to the same standard as 1.*Welle*.

5.*Welle* and 6.*Welle*

These nine divisions were established between September and November 1939 with combined tank destroyer and reconnaissance battalions.

7.*Welle* and 8.*Welle*

The 22 divisions formed by the 7.*Welle* and 8.*Welle* were issued with a reduced allotment of anti-tank guns in divisional tank destroyer and reconnaissance units (none were battalion size), or a weaker combined tank destroyer and reconnaissance battalion.

9.*Welle* and 10.*Welle* were security units and both were disbanded after the French campaign.

11.*Welle*

In October 1940, a further ten infantry divisions were established and all were allotted the standard number of with anti-tank weapons.

12.*Welle*

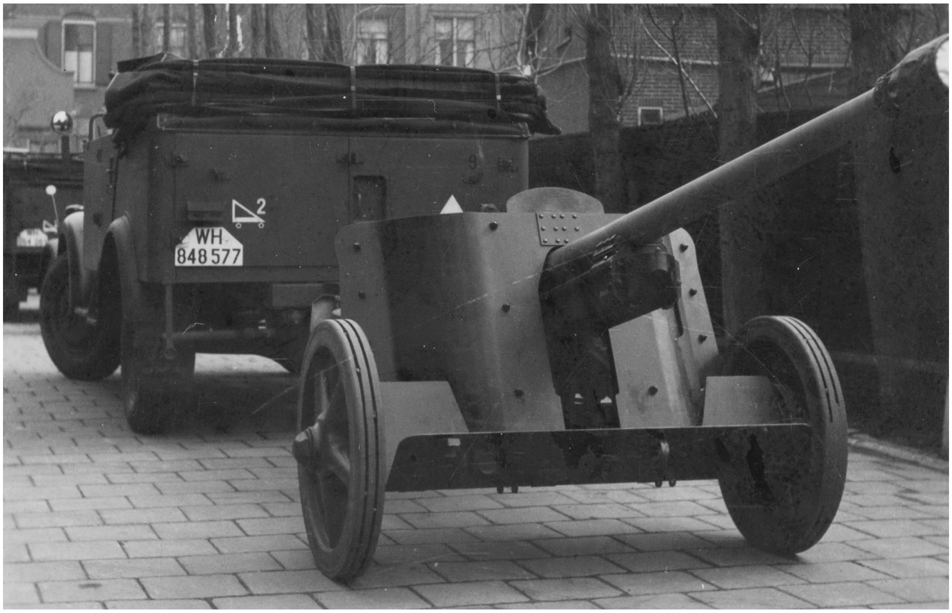
A further ten divisions were established in December 1940, but a number had only two companies in their tank destroyer battalions.

13.*Welle* and 14.*Welle*

The divisions of the 13.*Welle* and 14.*Welle* were established as *Bodenständige Einheiten* (standing [occupation] units) for service in France. All were to be equipped with captured French equipment and each had basic tank destroyer element. The 14.*Welle* was the last wave to be established before *Unternehmen* Barbarossa.

Infantry Division (mot)

After disbanding 1.leDiv to 4.leDiv in early 1940, only one remained in early 1941, with the intention of creating units which were tactically more mobile. In contrast to conventional infantry the number of infantry regiments was reduced to two, but all elements, including the artillery regiment, were to be motorized. Each infantry regiment had 12 PaK, and the attached reconnaissance company had a further three anti-tank guns. The divisional reconnaissance battalion had three PaK and the PzJgAbt was issued with 33 anti-tank guns.



Light trucks, such as the Steyr 1500A 1.5-ton *Mannschaftswagen* (personal carrier), were widely used as a towing vehicle for the 5cm PaK 38.

Light Division

Only one light division was established and this was to be combat ready by early 1941. This special purpose unit was formed of a tank regiment (PzRgt 5), an infantry brigade with two infantry battalions equipped with 24 anti-tank guns and a reconnaissance battalion issued with 13 PaK. The tank destroyer element was a formidable force: PzJgAbt 605 armed with 27 of the 4.7cm PaK(t) auf PzKpfw I self-propelled guns and PzJgAbt 39 equipped with 3.7cm and 5cm PaK totalling 33. It is noted in the *Kriegsgliederung* (order of battle) for 1941 that both PzRgt 5 and PzJgAbt 605 had been supplied with a flat-bed trailer for improved mobility; reminiscent of a pre-war light division.

Mountain Divisions

When compared with to most infantry divisions, the six *Gebirgsdivisionen* (GebrDiv – mountain divisions) were issued with weaker tank destroyer units. Each of the two infantry regiments had 12 PaK, and the tank destroyer battalion 24 or even 36 PaK. There was no uniformity in the organization of each individual unit, particularly reconnaissance which had only three anti-tank guns.

As the war progressed more waves of infantry divisions were initiated, but all would be subject to a steady number of organizational changes due to the constantly changing situation with the supply of personnel and equipment.

The SdKfz 10 (here towing a 3.7cm PaK) was probably the most versatile half-track vehicle in German service, but it was never built in sufficient numbers to meet requirements.

Waffen-SS

A number of Waffen-SS units were combat ready and all were equipped to the same standard as the infantry divisions formed in 1.*Welle*, but were motorized.

However five SS formations, SS-Div Totenkopf, SS-Div Das Reich, Leibstandarte-SS Adolf Hitler (LSSAH), SS-Div Wiking and SS Polizei-Division had variations in their structures, but all would still be better equipped than comparable *Wehrmacht* (army) units. While Totenkopf, Das Reich and Wiking had 36 PaK in their infantry regiments and 33 in their PzJgAbt, the LSSAH had a total of 48. Their reconnaissance battalions were provided with anti-tank guns as follows; 11 (Totenkopf), 14 (Das Reich), 13 (Wiking) and 20 (LSSAH). Das Reich had an additional *Sturmgeschütz* battery.

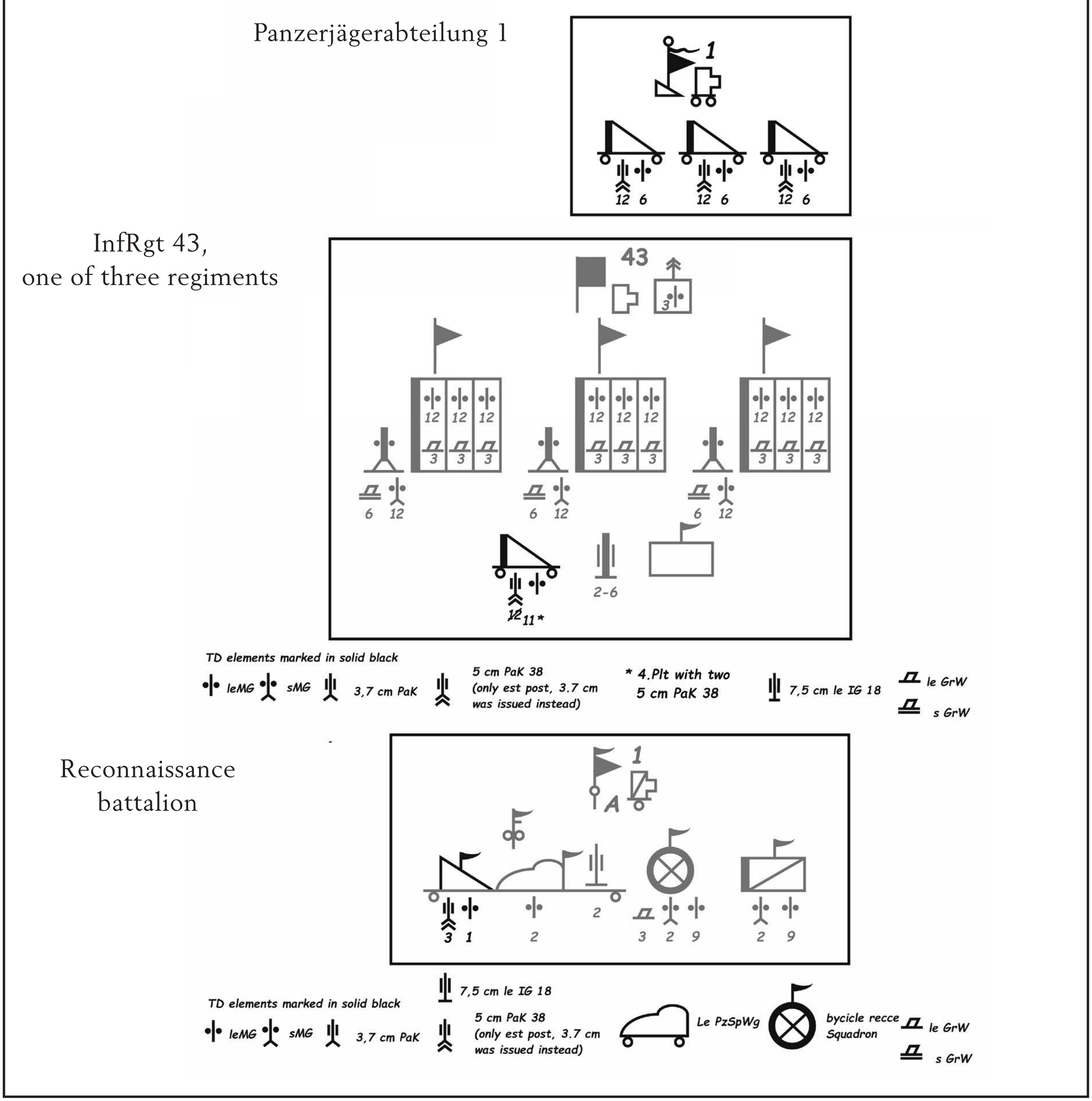
LSSAH PzJgAbt was an exception and had nine 4.7cm PaK(t) auf PzKpfw I self-propelled guns, and also a *Sturmgeschütz* battery.

Panzer Divisions

In early 1941, a total of 20 Panzer divisions were combat ready. The anti-tank element in each division was formed to the standard organizational structure. The structure for 13.PzDiv is a good example (see table). The *Schützen-Brigade* 13 had two rifle regiments each with two 3.7cm PaK-armed PzJgZug (tank-destroyer platoon), with a total of 12 guns. The brigade also had a *Kradschützen-*

Bataillon with a PzJgZug armed with three 3.7cm PaK. *Aufklärungs-Abteilung* 13 had a tank destroyer platoon armed with three PaK and a PzJgKp with a further ten guns. PzJgAbt 13 was provided with three companies each having three platoons; two armed with three 3.7cm PaK each and one with two 5cm PaK 38.

Tank Destroyer Elements of 1.InfDiv, February 1941


Panzerjägerabteilung 1
1
12 6
12 6
12 6
InfRgt 43,
one of three regiments
43
3
12 12 12
3 3 3
6 12
2-6
12 11*
TD elements marked in solid black
leMG
sMG
3,7 cm PaK
5 cm PaK 38 (only est post, 3.7 cm was issued instead)
* 4.Plt with two 5 cm PaK 38
7,5 cm le IG 18
le GrW
s GrW
Reconnaissance battalion
1
A
3 1
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3 2 9
2 9
7,5 cm le IG 18
TD elements marked in solid black
leMG
sMG
3,7 cm PaK
5 cm PaK 38 (only est post, 3.7 cm was issued instead)
Le PzSpWg
bycicle recce Squadron
le GrW
s GrW

Within certain limits the 5cm PaK 38, which weighed some 1,016kg, could be moved by its crew of five; the recently introduced castor wheel made this much easier.

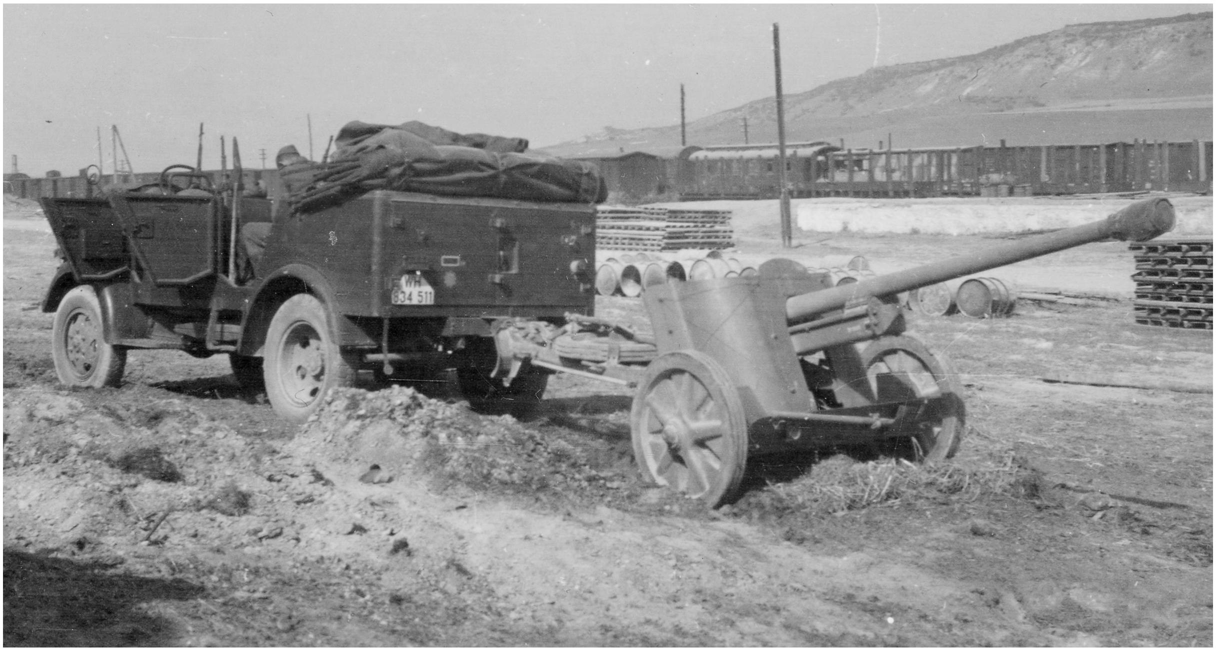
In the first months of 1941, a new series of *Kriegsstärkenachweisung* (KStN – table of organization) were published, but not all field units were able to adapt to these new structures. The 5cm PaK 38, which had recently entered service, was possibly the main reason for this significant change in planning due to a shortage of the new gun. As soon as they were delivered they were issued to divisional PzJgAbt at a rate of two per company. Tank destroyer elements in infantry regiments, rifle brigades and the attached reconnaissance units were forced to continue using the 3.7cm PaK.

The following structures were authorized between January and February 1941, and implemented by newly established units. Later in 1941, many battle-worn units were reformed or partially reformed using these new structures.

Infantry and Tank Divisions, and Other Units

KStN 1122, dated 31 January 1941
    Panzerjäger-Zug: three guns.
KStN 1122 (gp), dated 31 January 1941
    Panzerjäger-Zug: three guns (*gepanzert*).

These units were attached to infantry regiments and reconnaissance battalions in the division. KStN 1122 (gp) was specifically produced for motorized infantry units and Panzer divisions; the document authorized each to have five SdKfz 250 light armoured half-track carriers. But due to the constant shortage of the type, units were issued with the SdKfz 10.



A Mercedes-Benz L1500A *Mannschaftswagen* (personal carrier) (Kfz 15 or Kfz 70) was also used as a gun tractor to tow the 5cm Pak 38. The vehicle had high ground clearance and proved to be robust enough to stand the harsh conditions in the east.

KStN 188c, dated 31 January 1941.

Panzerjäger-Zug (mot): two 5cm PaK.

KStN 215, dated 31 January 1941.

Infanterie-Panzerjäger-Zug (mot): two 5cm PaK.

and were introduced to issue the small numbers of the new 5cm PaK. This platoon furnished with two guns was authorized for the divisional tank-destroyer battalion only, and replaced one of four gun platoons. The front-line regimental tank destroyer units remained equipped with the 3.7cm PaK. KStN 215 authorized the Krupp Protzkraftwagen (Kfz 69) towing vehicle for infantry divisions to replace horses, and the SdKfz 10 for motorized infantry divisions. A month later, a new version of KStN 215 was published, and this allowed three 5cm PaK per platoon.

KStN 184c, dated 31 January 1941.

Infanterie-Panzerjäger-Kompanie c (mot): 12 guns.

This structure was created for twelve 3.7cm PaK, but in three variations: *Ausführung* (Ausf – type) A, specified the Kfz 12 cross-country car as a towing vehicle; Ausf B, specified the Kfz 69; Ausf C, specified the SdKfz 10 halftrack.

The choice of towing vehicle also influenced the number of ammunition supply vehicles in a company.

But as there was a constant shortage of suitable vehicles for this purpose, German forces were compelled to use light trucks or even equipment captured intact from the enemy.

KStN 184d, dated 31 January 1941.

Infanterie-Panzerjäger-Kompanie d (mot *Zug*): 12 guns.

This structure implemented some further changes. Unlike the 184 c, nine 3.7cm PaK and two 5cm PaK 39 were now authorized. Furthermore, the French-built Chenilette *gepanzerte Kettenschlepper Chenilette mit Anhänger* (fully-tracked tractor with a fully-tracked trailer) were provided.

KStN 187, dated 31 January 1941.

Gebirgsjäger-Panzerjäger-Kompanie d (mot *Zug*): 12 guns.

This structure provided for mountain divisions to have twelve 3.7cm PaK towed by Kfz 12. There are no obvious changes to KStN 184.

KStN 1141, dated 1 February 1941.

Panzerjäger-Kompanie a (mot *Zug*): 12 guns.

KStN 1142, dated 1 February 1941.

Panzerjäger-Kompanie c (mot *Zug*): eight 3.7cm and three 5cm guns)

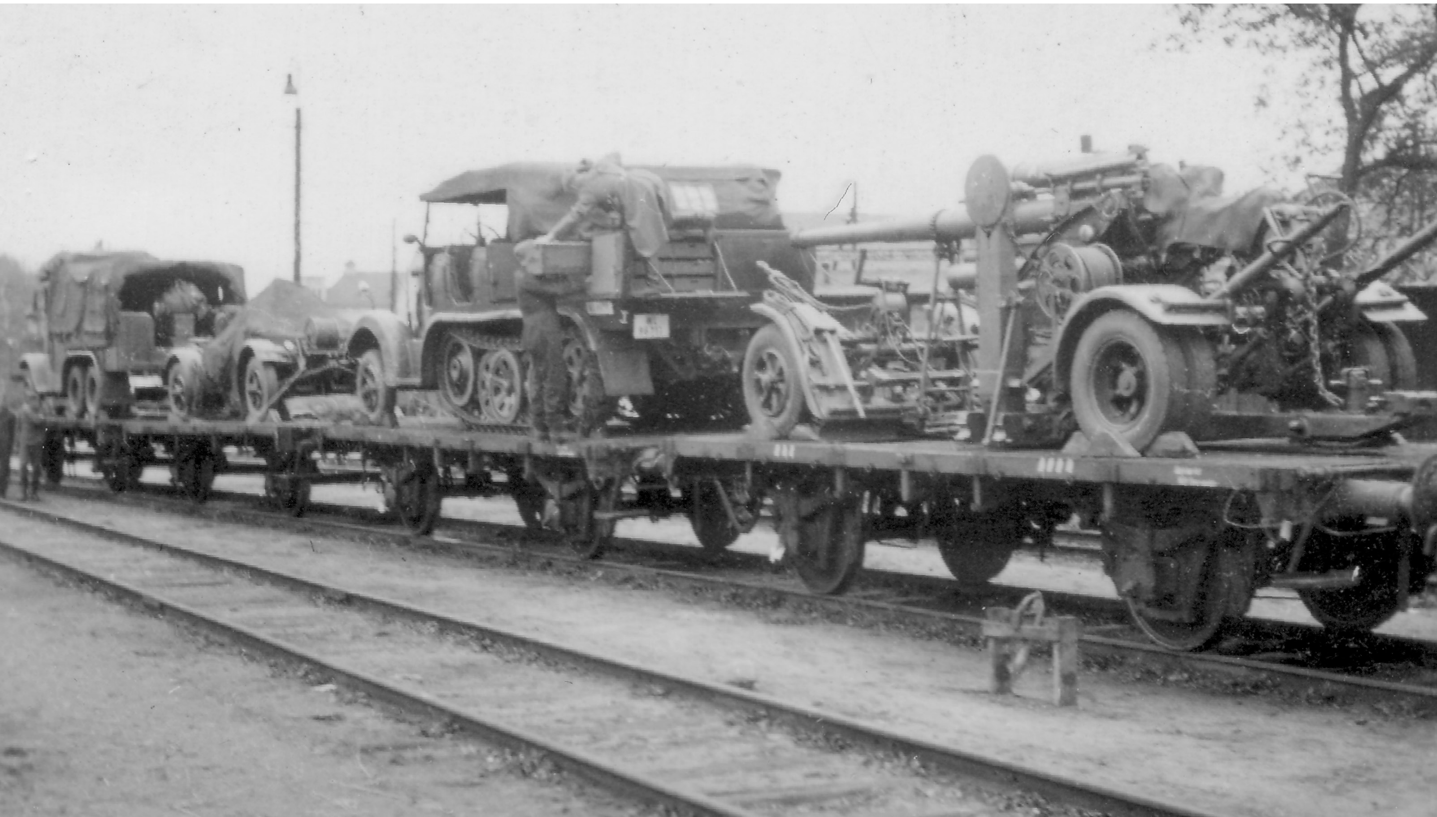
KStN 1143, dated 1 February 1941.

Panzerjäger-Kompanie b (mot *Zug*): 12 guns.

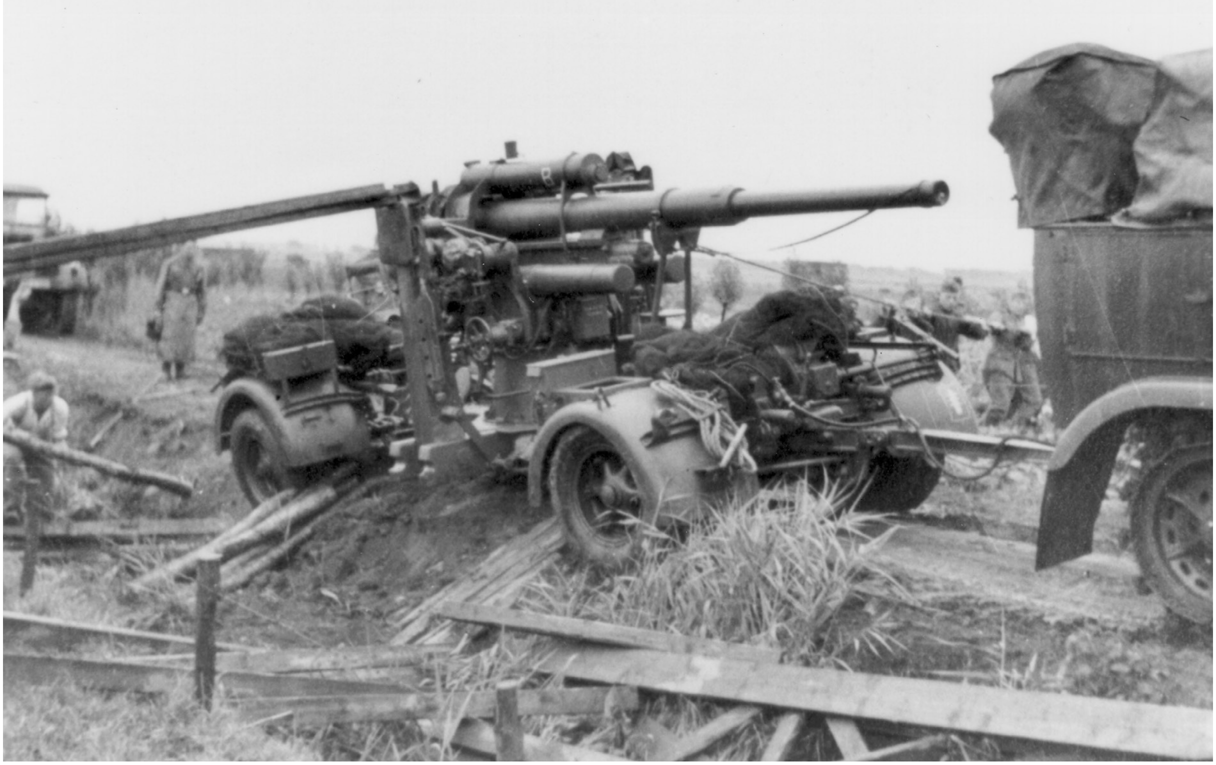
KStN 1144, dated 1 February 1941.

Panzerjäger-Kompanie (mot *Zug*): nine guns.

Apparently these structures were used almost solely for tank and motorized infantry divisions, and differed mainly by the number and type of anti-tank gun. Interestingly, KStN 1144 reduced the allotment of guns.



Many *Luftwaffe* and *Heeres* (army)-FlaK units were ordered to be deployed for Barbarossa. Here an 8.8cm FlaK 18 and its SdKfz 7 half-track tractor have been loaded on railway wagons for transport to the east. Note the gun has been dismounted from its road bogies.



Moving the 8.8cm FlaK 36 was not without problems. Here the bogey wheels have simply destroyed the edge of a track and slipped into a ditch. This would become a major recovery action.

KStN 1146, dated 1 February 1941.

Panzerjäger-Kompanie (mot *Zug*): six 8.8cm FlaK 18.

This structure has not been found, so it cannot be confirmed that any army unit was established accordingly.

Only two structures are known for airborne army units:

KStN 184 (LL), dated 1 February 1941.

Infanterie-Panzerjäger-Kompanie LL: 12 guns.

This tank destroyer company was created for airborne units. It was authorized to have twelve 3.7cm guns.

KStN 1141(LL), dated 1 February 1941.

Panzerjäger-Kompanie a (mot *Zug*): 12 guns.

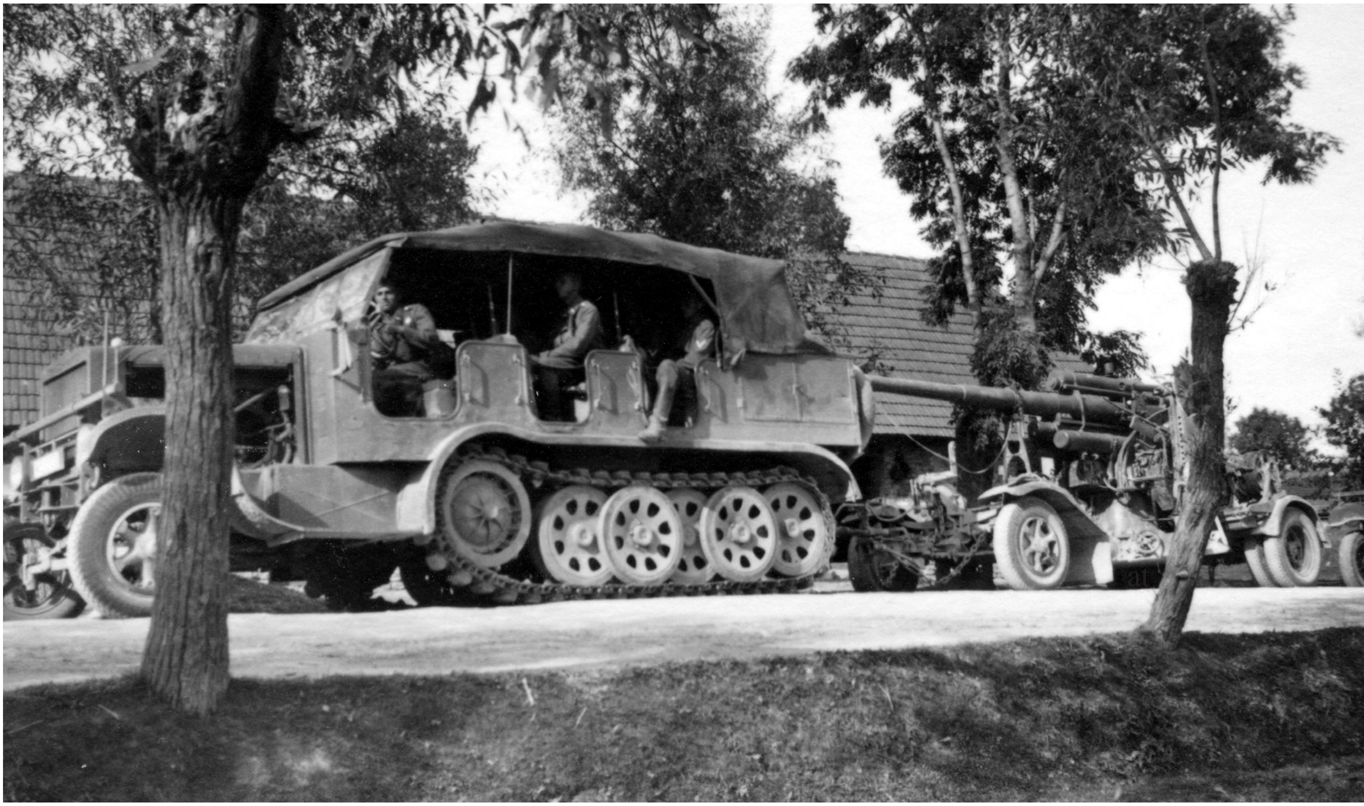
An alternative structure for airborne units having two platoons each with four 2.8cm s PzB 41 guns, and one platoon with four 3.7cm PaK.

Heerestruppen

In February 1941 the following *Panzerjäger* units were issued to independent *Heerestruppen* (army troops):

Two 8.8cm FlaK 18, possibly part of a battery of four, positioned in the open on a field of wheat. This could be dangerous, since any incendiary fire from the enemy could easily set fire to the wheat and stubble.

- The number of independent PzJgAbt armed with the 3.7cm PaK was increased from five to seven (463, 559, 561, 563, 611, 652 and 654). According to the *Kriegsgliederung*, all units had 3.7cm PaK and a platoon armed with the 2.8cm s PzB 41. PzJgAbt 559 was re-equipped in March with 27 of the 4.7cm PaK (t) auf Pzkpfw R 35(f) self-propelled guns.
- Former *BunkerFlak* units, PzJgAbt 525, 560 and 605 were disbanded after the French campaign. Later, PzJgAbt 525 and 560 were reformed and armed with 18 ex-Austrian army 4.7cm Böhler guns, (one of the few units confirmed to have the gun), and 12 of an unknown type of 3.7cm gun. In July 1940, PzJgAbt 605 was rearmed with the 3.7cm PaK, but in October received 27 self-propelled 4.7cm PaK(t) auf PzKpfw I (Sfl). This unit was not mentioned in the KStN published in February 1941, as it was about to be attached to 5.leDiv and sent to North Africa.
- Five further PzJgAbt (Sfl) – 521, 529, 616, 643 and 670 – had also been issued with the 4.7cm PaK(t) auf PzKpfw R 35(f)). In March 1941, PzJgAbt 559 was also issued with the 4.7cm PaK(t) auf PzKpfw R 35(f)..
- Special weapons: The most powerful anti-tank weapon in service with the *Panzerjägertruppe*; the 8.8cm FlaK. must not be forgotten in this context. Three *BunkerFlak* units had been disbanded due to their overall poor



A *Luftwaffe* unit on their way to the front with their 8.8cm FlaK 18: the SdKfz 7 half-track tractor is an early Krauss Maffei m8. Few of these early tractors would survive the first year of combat in Russia.

performance on the battlefront, and only the 1./s PzJgAbt 8 equipped with only six 8.8cm FlaK 18 (Sfl) remained in service. However, these few vehicles would not play a significant role in the coming battle.

In early 1941, development began on another two types of special purpose weapon.

10cm K auf PzSfl IVa

In 1938, Krupp was contracted to develop a self-propelled artillery piece mounting a gun capable of destroying heavy concrete fortifications. The barrel of a 10.5cm *Kanone* L/52 was chosen and was to be mounted in an open-top superstructure built on the chassis of a PzKpfw IV. To facilitate this, the engine was repositioned to the centre of the hull, with the gun mounted almost directly above. It was hoped that the vehicle would be combat ready for the assault on The Low Countries and France, as a *Schartenbrecher* (bunker buster). However, the vehicle was not ready and after the victory in France its intended purpose had become obsolete. In February 1941, Krupp reported that two vehicles were ready and both were issued to PzJgAbt 521 as heavy tank destroyers.

10cm K auf PzSfl IVa, Data

Calibre	10cm
Barrel length	5,200mm = L/52*
Maximum range	3,400m
Muzzle velocity	822mps*
Side traverse	16°
Elevation range	-15 to +10°
Rate of fire	10 to 12rpm
Weight in firing position	22t
Engine	Maybach HL 66
Maximum speed	27kph
Armour penetration at 500m	155mm
Armour penetration at 1,000m	138mm
Armour penetration at 2,000m	111mm

* different to the original specification

12.8cm K 40 auf PzSfl V

At the same time as Krupp was contracted to develop what would become the PzKpfw [Sfl] IVa, Henschel also received a contract commissioned to develop a self-propelled gun; another heavy *Schartenbrecher*. The gun chosen was the very powerful 12.8cm FlaK, and Henschel utilized many components from the prototype of their VK 3001 design, but fitted with the chassis with inter-leaved suspension. The gun was mounted over the engine compartment and a narrow open-top armoured superstructure was fitted to protect the crew. However, the vehicle was still at the development stage when *Unternehmen* Barbarossa was launched.

12.8cm K auf PzSfl V, Data

Calibre	12.8cm
Barrel length	9,100mm = L/71
Maximum range	3,000m
Muzzle velocity	880mps*
Side traverse	12°
Elevation range	-15 to +10°
Rate of fire	10 to 12rpm
Weight in firing position	36.6t
Engine	Maybach HL116S
Maximum speed	25kph
Armour penetration at 500m	175mm
Armour penetration at 1,000m	150mm
Armour penetration at 2,000m	130mm

North Africa 10

As the *Blitzkrieg* assault on France ended, Hitler became more and more disturbed at the activities of his long-standing ally, Benito Mussolini. The Italian dictator, who had become the 27th Prime Minister of Italy on 31 October 1922, had for a long time been focusing his attention on countries around the Mediterranean as part of his plan for Italian domination. In September 1940, Italian troops launched several attacks from occupied Libya against British positions in Egypt. After gaining some ground the British overcame the surprise and decided to launch a counteroffensive. On 9 December 1940, Field Marshall Wavell launched Operation *Compass*, and began to push the Italian troops. Command of the operation was passed to LtGen O'Connor whose forces continued the fight and defeated the Italians at El Agheila on 9 February 1941.

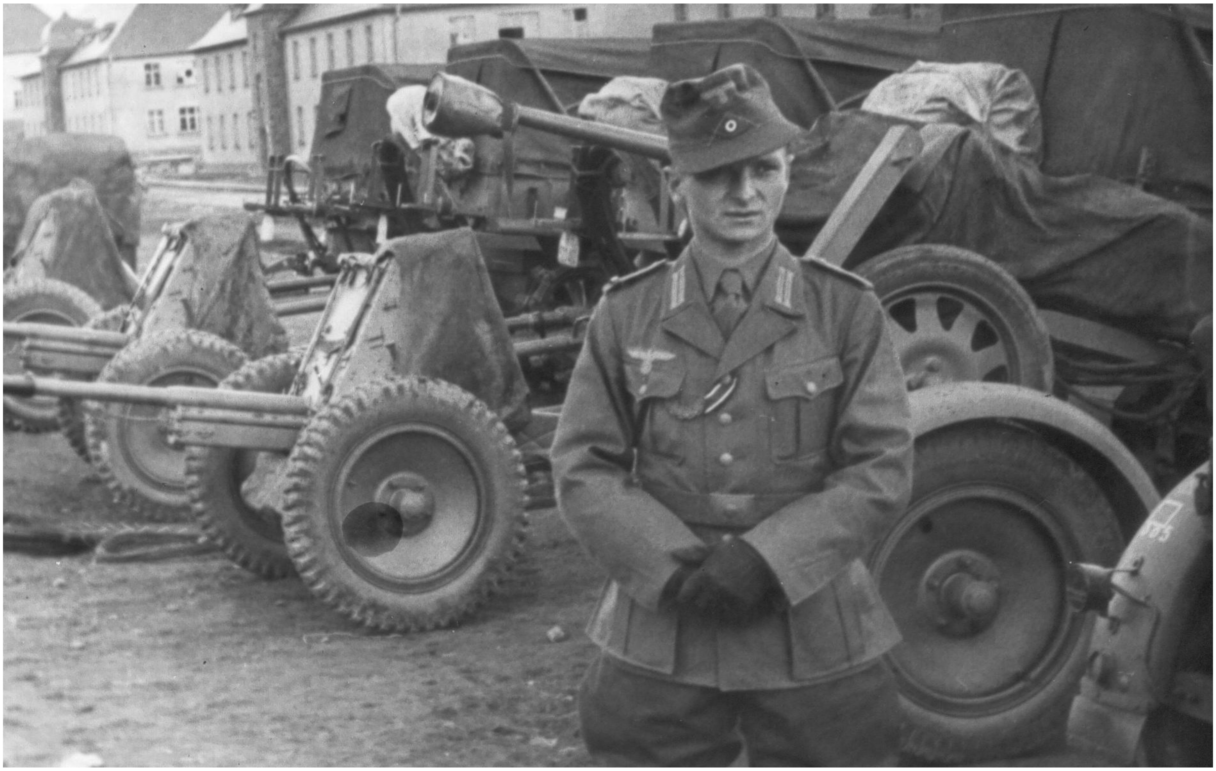
As a result of Mussolini's actions, Hitler felt compelled to order German military forces to open a new front. In January 1941 he reluctantly agreed to establish a *Sperrverband für Nord Afrika* (blocking formation North Africa).

The Balkans

Hitler had first become alarmed when Italian forces occupying Albania launched an assault against Greece on 28 October 1940. Their short *Blitzkrieg*-type attack failed as Greek troops, assisted by the Royal Navy and later the RAF, defeated the invaders on 22 November 1940.

As a consequence, British troops were sent to Greece and the island of Crete.

During the many flowing battles of the desert war, the 8.8cm FlaK 18 played a prominent role. With this gun long-range combat against British tanks, especially the Infantry Tank Mk II (Matilda II) was achievable.



Anti-tank guns of an unknown unit shortly before it was transferred to North Africa. Behind the officer there is a 2.8cm s PzB 41 on an SdAnh 32, but all other guns are 3.7cm PaK. The only towing vehicles are SdKfz 10 half-track tractors.

Hitler sought calm in the Balkans, but the unilateral action taken by Mussolini forced the Germans to become involved before launching the invasion of the Soviet Union. Yugoslavia was invaded on 6 April 1941 and bombed into submission by 17 April: German forces then entered Greece and despite a resolute defence by Greek and British troops, marched in triumph through the streets of Athens on 27 April 1941.

The strategically important access was secured.

Rommel Arrives in North Africa

On 11 February 1941, the first German units were landed in Tripoli. The 5.leDiv (with PzRgt 5) and 15.PzDiv (with PzRgt 8) constituted a strong force with a total of 142 PzKpfw III armed with a 5cm KwK L/42 and 40 PzKpfw IV armed with 7.5cm KwK L/24. The attached anti-tank force was, when compared to other German units, considerably stronger (see table).

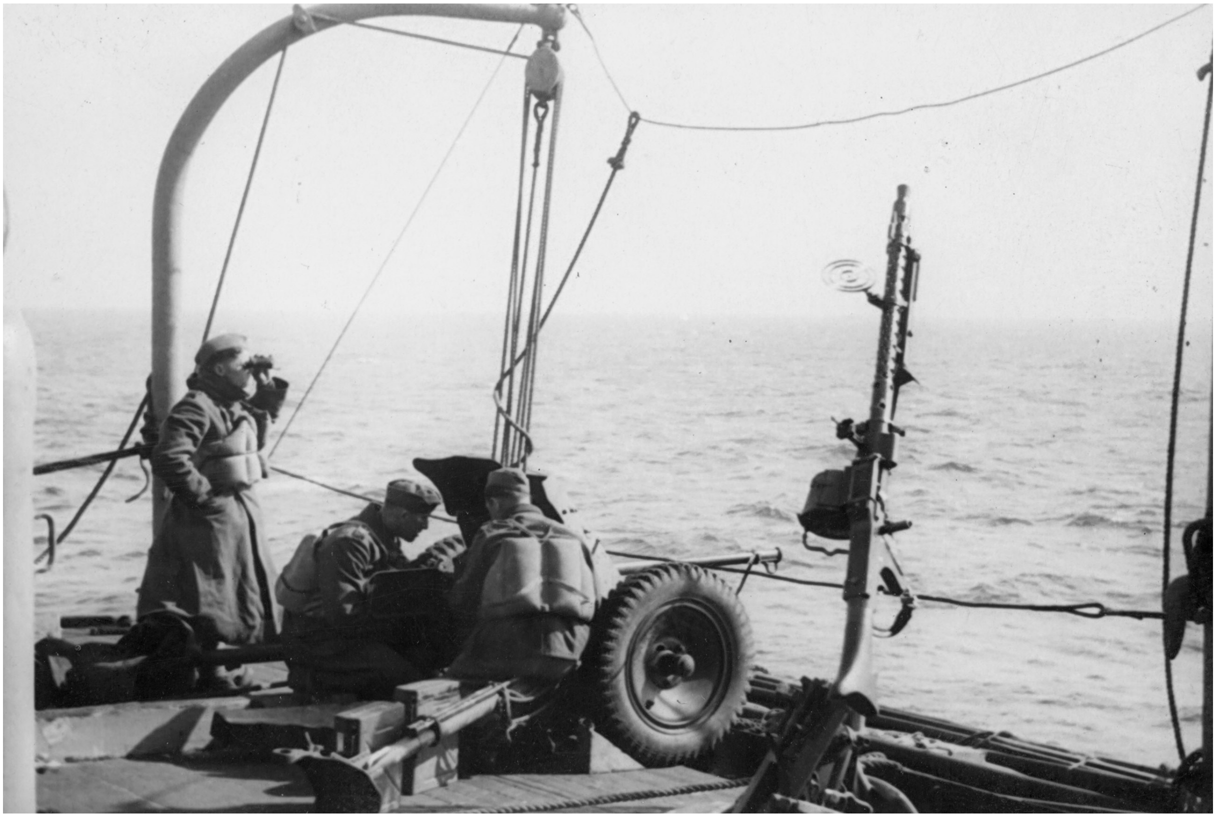
The 15.PzDiv was outfitted as a standard tank division, but was equipped with a small number of 2.8cm s PzB 41. Also it appears that every tank-destroyer subunit received at least one of these weapons (see table).

The 5.leDiv had two machine-gun battalions, replacing the two rifle regiments (four rifle battalions) in a typical Panzer division. Both were equipped with ten SdKfz 250 and ten 251 armoured halftracks, and also a number of light 3.7cm PaK plus 18 s PzB 41 each in their heavy machine-gun companies. The *Panzerjäger* detachment was extremely well equipped: PzJgAbt 39 was formed of three companies armed with 3.7cm and 5cm PaK 38; PzJgAbt 605 with 27 PzJg I was also available. The army FlaK detachment had been reinforced with three batteries each with four 8.8cm guns.

The fact that 5.leDiv was designated as a mobile unit is confirmed by PzJgAbt 605 being issued with nine flatbed trailers (SdAnh 115) and half-track towing vehicles (possibly SdKfz 7): the latter because thought was given to the very long distances expected in the coming desert warfare. The PzJg I self-propelled anti-tank gun was considered to be a vital combat asset and it was possible that the type was treated with care in order to preserve serviceability.

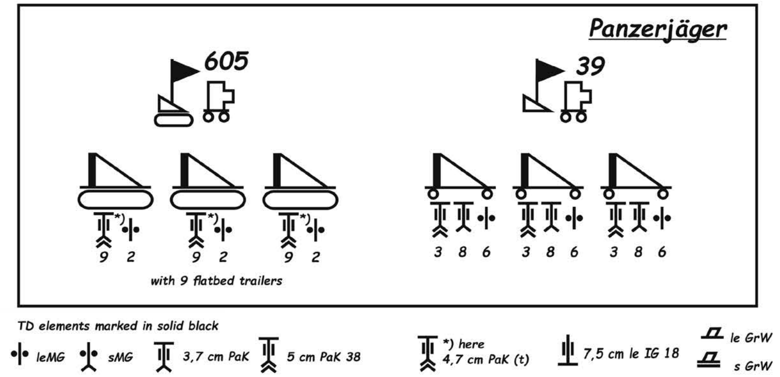
The integration of I./FlaK-Regiment 33 is interesting, since heavy anti-aircraft weapons would be of little use in their intended role (medium to high-altitude anti-aircraft defence), and it is likely that German military planners had foreseen the arrival of heavier armoured British tanks. In 1940, German

A 3.7cm gun has been positioned on the deck of a transport ship in preparation for arriving in Tripoli. To the right is a pedestal-mounted MG 34 fitted with a drum magazine and anti-aircraft ring-type gunsight.

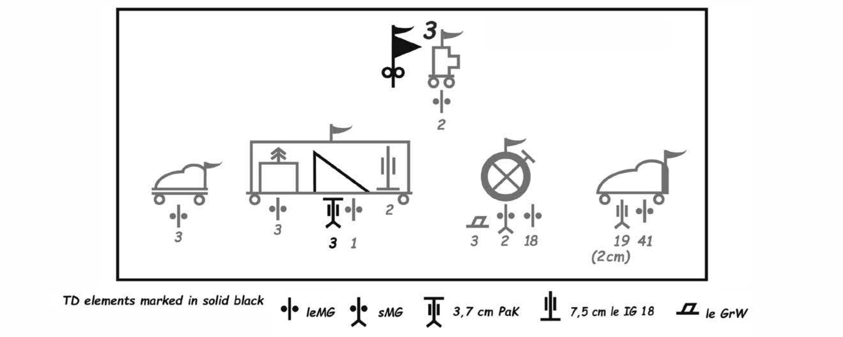


Tank Destroyer Elements of 5.leDiv, May 1941

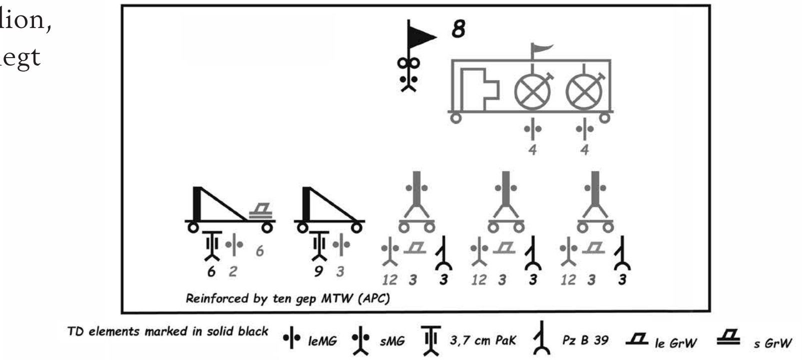
Divisional PzJgAbt 39, *Heerestruppen* PzJgAbt 605 subordinated


Panzerjäger
605
39
*)
9 2
9 2
9 2
with 9 flatbed trailers
3 8 6
3 8 6
3 8 6
TD elements marked in solid black
leMG
sMG
3,7 cm PaK
5 cm PaK 38
*) here 4,7 cm PaK (t)
7,5 cm le IG 18
le GrW
s GrW

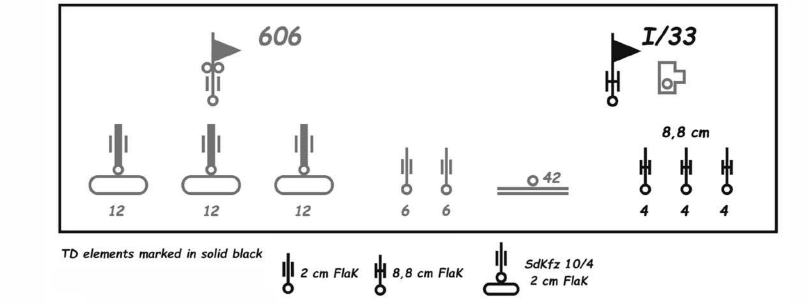
Reconnaissance battalion


3
2
3
3
3 1
2
3 2 18
19 41
(2cm)
TD elements marked in solid black
leMG
sMG
3,7 cm PaK
7,5 cm le IG 18
le GrW

Machine-gun battalion, one of two in InfRegt 200

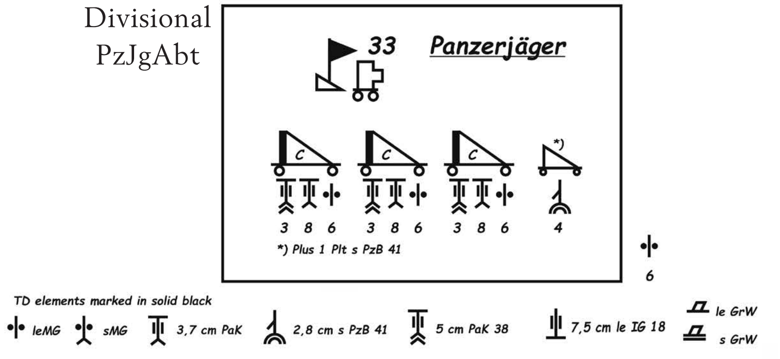

8
4 4
6
6 2
9 3
12 3 3
12 3 3
12 3 3
Reinforced by ten gep MTW (APC)
TD elements marked in solid black
leMG
sMG
3,7 cm PaK
Pz B 39
le GrW
s GrW

Anti-aircraft detachment

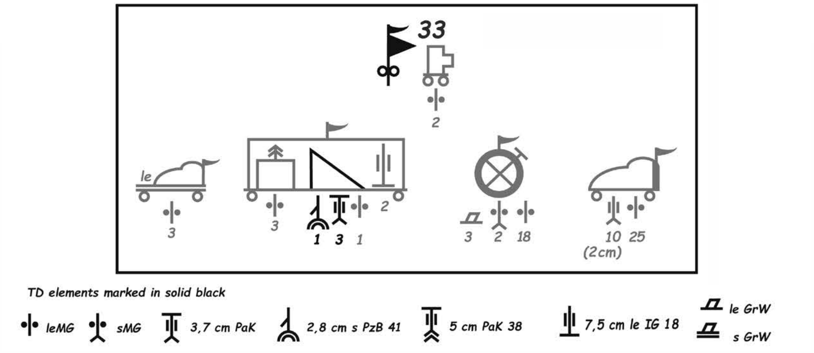

606
I/33
12
12
12
6 6
42
8,8 cm
4 4 4
TD elements marked in solid black
2 cm FlaK
8,8 cm FlaK
SdKfz 10/4 2 cm FlaK

Tank Destroyer Elements of 15.PzDiv, February 1941

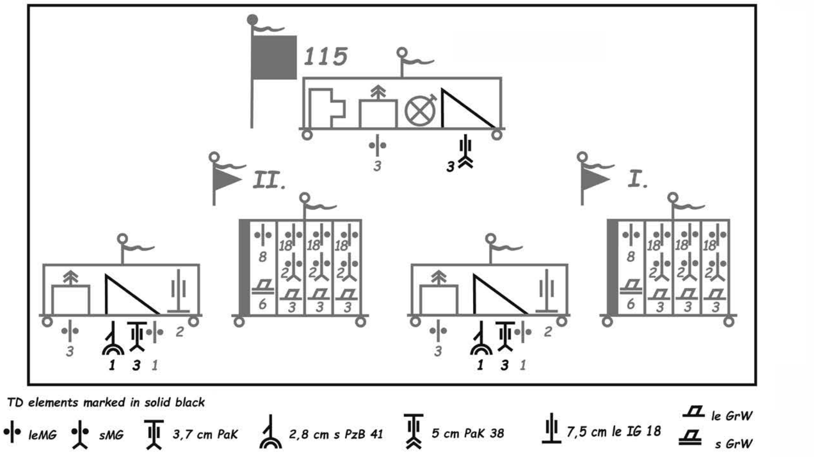
Divisional PzJgAbt


33
Panzerjäger
c
c
c
*)
3 8 6
3 8 6
3 8 6
4
*) Plus 1 Plt s PzB 41
6
TD elements marked in solid black
leMG
sMG
3,7 cm PaK
2,8 cm s PzB 41
5 cm PaK 38
7,5 cm le IG 18
le GrW
s GrW

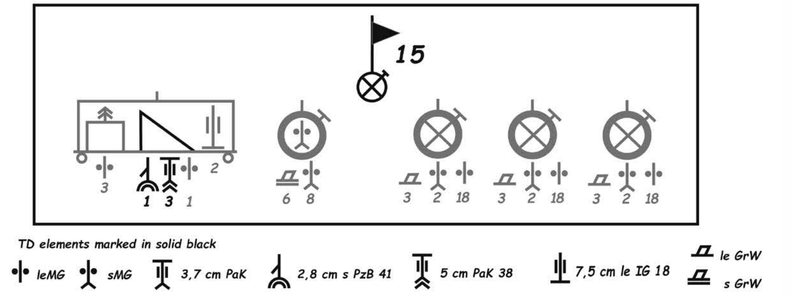
Reconnaissance battalion


33
2
le
3
3
1 3 1
2
3 2 18
10 25
(2cm)
TD elements marked in solid black
leMG
sMG
3,7 cm PaK
2,8 cm s PzB 41
5 cm PaK 38
7,5 cm le IG 18
le GrW
s GrW

Rifle regiment, one of two in Rifle Brigade 15


115
3
3
II.
I.
8
18 18 18
2 2 2
6
3 3 3
3
1 3 1
2
TD elements marked in solid black
leMG
sMG
3,7 cm PaK
2,8 cm s PzB 41
5 cm PaK 38
7,5 cm le IG 18
le GrW
s GrW

Motorcycle battalion


15
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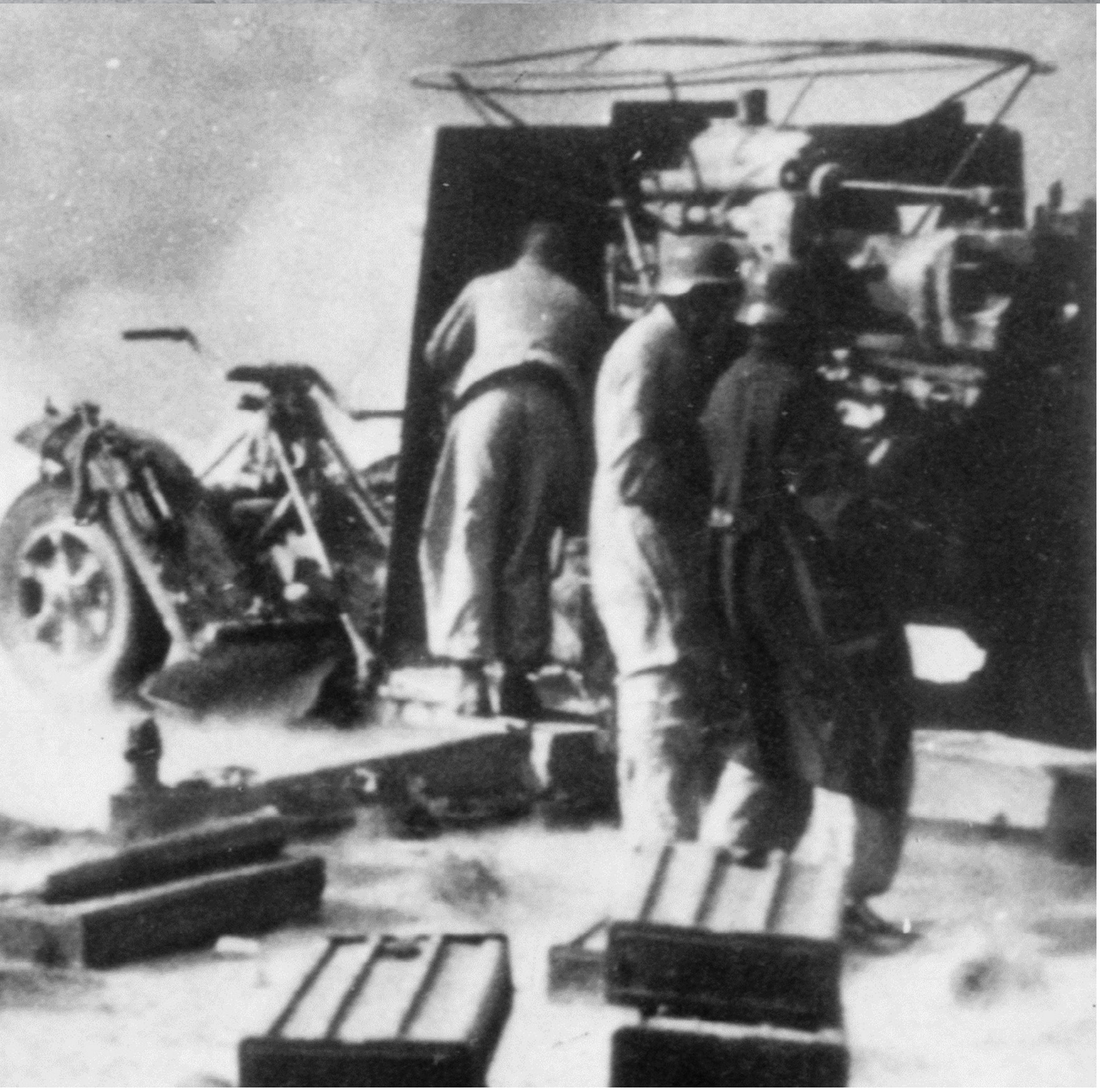
1 3 1
2
6 8
3 2 18
3 2 18
3 2 18
TD elements marked in solid black
leMG
sMG
3,7 cm PaK
2,8 cm s PzB 41
5 cm PaK 38
7,5 cm le IG 18
le GrW
s GrW

Dismounted from its transport bogies, an 8.8cm FlaK opens fire at a distant target. At the left, the *Geschützführer* (gun commander) observes the impact through his binoculars. Note that crew has fitted a structure over the gun shield to support camouflage netting.

tank crews had encountered the Infantry Tank Mk II (Matilda II) in France, and found that it was almost impervious to fire from the 5cm KwK L/42 (PzKpfw III) and the 7.5cm KwK L/24 (PzKpfw IV).

8.8cm FlaK

Prior to the French campaign the *Luftwaffe* had been ordered to supply *FlaK-Abteilungen* (anti-aircraft battalions) at a rate of one for each army corps, and one for each Panzer division. It was planned to issue a heavy artillery regiment to each infantry division with one battalion 15cm s FH, one battalion 10cm s K8 and one heavy FlaK battalion, but this would be a long-term proposition. Light weapons (2cm and 3.7cm) to defend against ground-attack aircraft were also available. But it soon became obvious that such a light anti-aircraft force would not be sufficient to defend ground forces



during a rapid advance. However, combat against enemy tanks which have broken through the frontline were always deemed to be within the scope of the *Panzerabwehr aller Waffen* (anti-tank defence by all weapons).

At this point it is worth recalling the proposal, made by the infantry in 1939, to equip every division with an 8.8cm-armed tank destroyer unit. However this was never achieved.

The *Merkblatt* 9/13 contained the guidelines for deploying the anti-aircraft artillery for ground combat:

> I. General notes
>
> 1) The main task for the FlaK artillery is the protection against enemy air attack. But due to an increase in enemy action and high losses on our side, any commitment for the ground-combat role must be restricted to special tactical situations only.

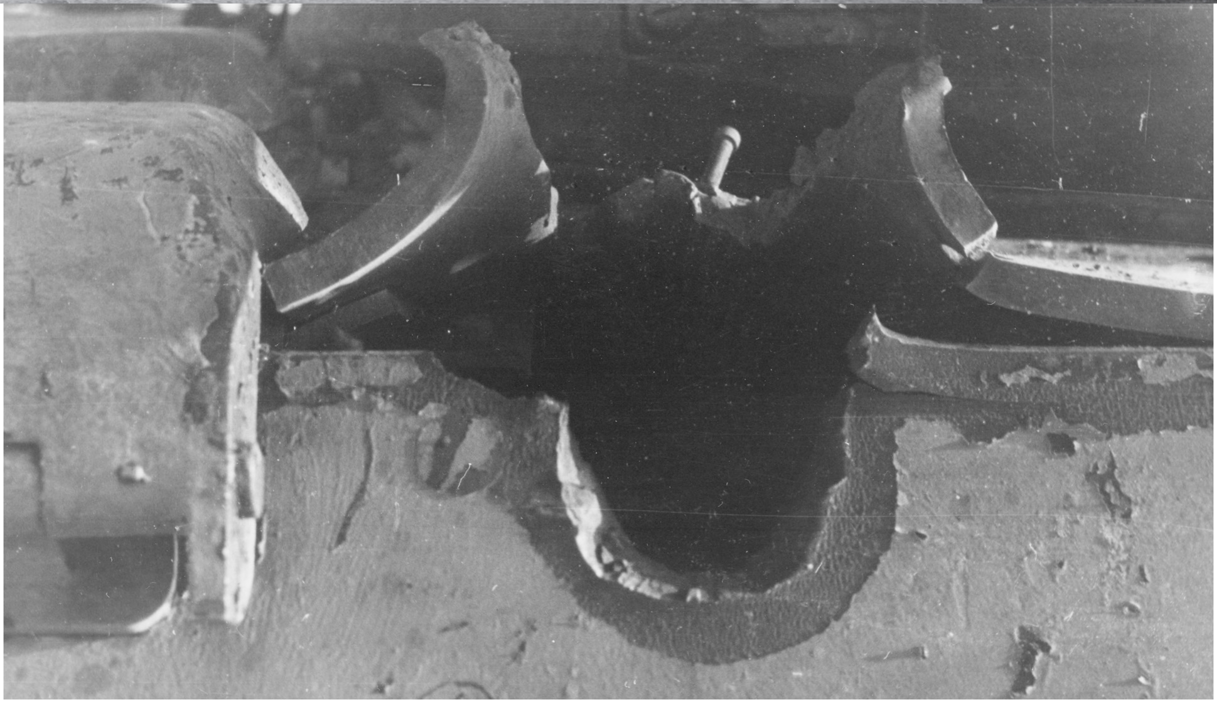
Above: Elements of a heavy anti-aircraft battery pause during their move to a new position. The 8.8cm FlaK are towed by SdKfz 7 heavy half-track tractors. All the vehicles and guns are painted dark grey; not the best choice for the North African desert.

Right: An 8.8cm FlaK in desert sand colour to 'hide' in the terrain, but still very prominent on the battlefield and easy to spot from the air or attack by British field artillery.

2) The order for the commitment of FlaK artillery for combat in a critical situation will be given by an officer at headquarters… In an emergency situation (a breaking through by enemy tanks) the troop leader (minimum divisional commander) is authorized to give respective orders.

6) Choice of gun positions

The choice of gun positions for air-raid protection is in the responsibility



The effect of the 8.8cm PzGrPatr (armour-piercing round) was devastating: The 80mm-thick front armour of a British Infantry Tank Mk II (Matilda II) has been easily penetrated by a shot fired at very close range.

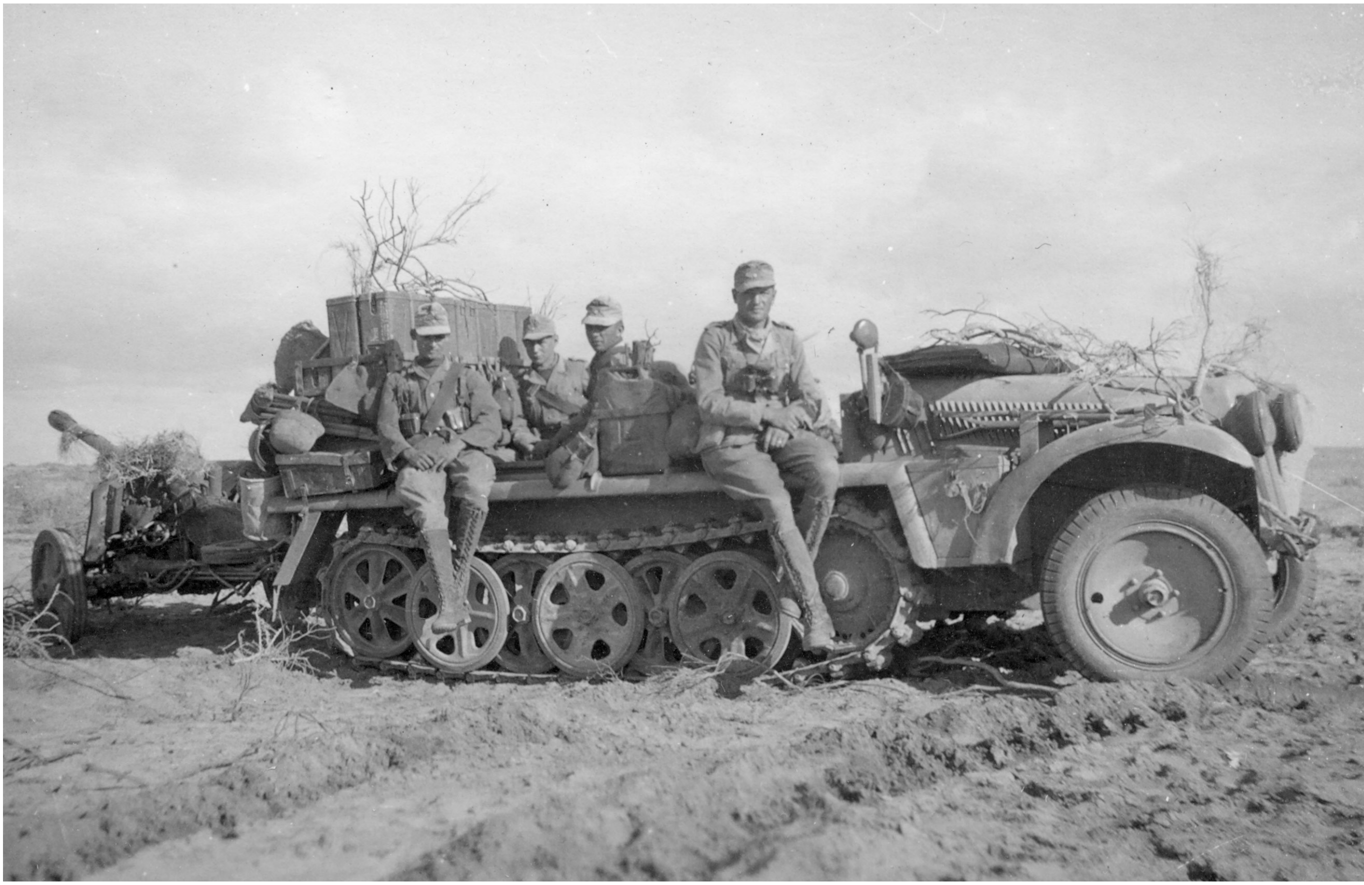
of the commander of the FlaK unit. For any commitment against tanks, the FlaK artillery must be deployed to the rear of the battlefield in deeply staggered positions and also be well camouflaged against enemy observation. The guns must not be deployed in or adjacent to frontline positions – this is strictly forbidden. Due to their size and obvious profile, guns deployed in this way will soon be recognized and quickly put out of action.

II. Commitment against tanks

1) All FlaK units selected for anti-tank defence duty will receive orders from the army commander responsible as defined in the *Panzerabwehrplan* (anti-tank plan).
2) Heavy FlaK artillery must be deployed in the depth throughout the battlefield, without *FlaK-Sondergerät* (special equipment such as fire control units and fuse setting machines.)
3) Any mobile commitment as *Panzerjäger* is not possible.
4) A massed tank attack can only be defeated by *FlaK-Kampfgruppen* (combat groups). A single gun deployed on the main battlefield will be destroyed before going into action, or even ignored and passed.
7) Light and medium FlaK artillery is not suitable for combat against tanks.

III. Commitment against other ground targets

1) Any fire by heavy FlaK against targets other than tanks must be restricted to a particularly worthwhile target. When over-used the wear in the barrel of an 8.8cm FlaK reduces accuracy against air targets.



A 5cm PaK 38 towed by a SdKfz 10 half-track tractor. The crew has added a rack on the rear of the vehicle to carry extra equipment and supplies; most certainly cans of water and fuel and also ammunition, while not overloading the vehicle.

The guidelines follow a purely defensive approach by restricting any possible combat usage of the 8.8cm FlaK. But, the coming battles in the deserts of North Africa would require a more belligerent approach.

Rommel, as commander-in-chief North Africa, decided to ignore the directive. After halting the British sooner than expected, he initiated a counteroffensive at the end of March. Two weeks later, after a rapid advance, the *Afrika Korps* had advanced to Tobruk and Sollum. Such was the speed of his attack that he failed to anticipate any difficulties with receiving supplies from stocks held in distant dumps. Transport vehicles making the delivery run over the open desert terrain were subjected to constant attack by enemy fighter bombers. Rommel was now forced to go onto the defensive, he could not continue his advance to victory nor could he retreat, such was the supply problem; particularly fuel for his tanks. His rapid attack was tactically successful, but strategically it would be seen as an abject failure.

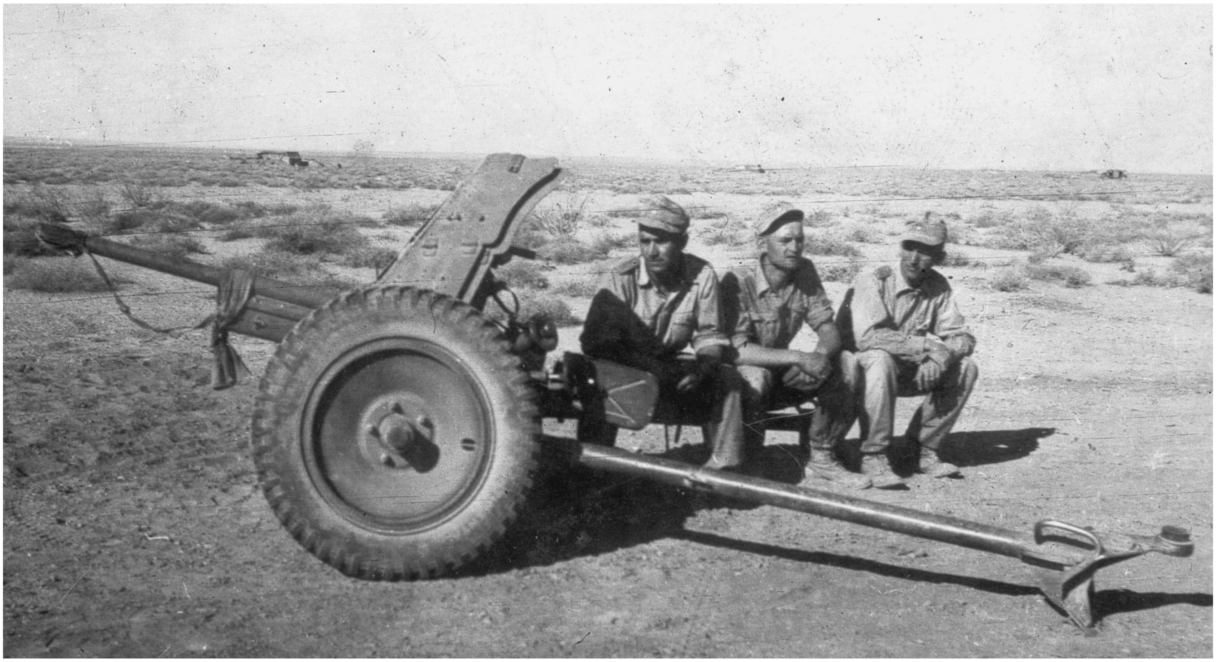
The 5.leDiv delivered their first comprehensive after-action report dated 12 June 1941:

Short summary of the hitherto made experiences in Africa:

Tactical experiences:

a) The march

Units had to either pass through terrain without any natural cover, or use the only made-up road (Via Balbia). Due to the lack of cover and the considerable cloud of dust we created, such movements were easily observable from the air. It is imperative to protect our formations against strafing aircraft by using active defence (2cm FlaK, if possible on SP carriers, integrated in the columns, and by machine guns [double where possible] mounted on motor vehicles). The distance between the vehicles must be as great as possible (250m). Marching by compass during darkness can initiate serious problems with orientation… it resembles the navigation of a ship at sea. If the tactical situation allows, simply-made road signs (used fuel drums, pennants etc.) must be positioned. Tanks will have to carry additional fuel and water in cans (five cans on each PzKpfw III and IV). The drivers must be urged to regularly check their stock of fuel, oil and water. More than in any other theatre of war, the crew must be able to repair simple mechanical problems with their vehicle without requesting workshop assistance. During the hottest part of the day and if the situation allows, all tanks, halftrack and motor vehicles should be halted in order to minimize wear on the road wheels and track pads of the tanks and tyres on the motor vehicles.



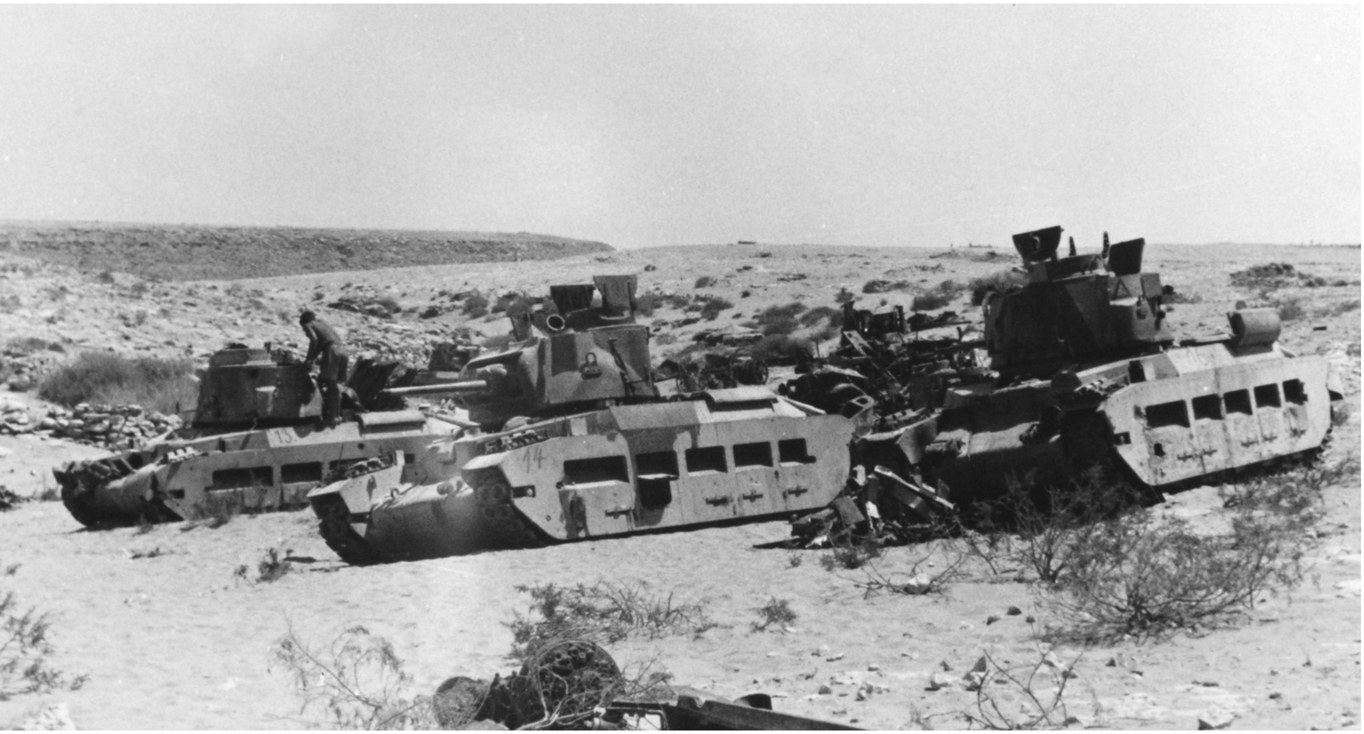
A 3.7cm PaK fitted with a double-layer gun shield taken from a spare or destroyed gun. The practice was detailed in leaflets distributed by the German army. The doubled shield improved protection for the gun crew from heavy infantry bullets.

Since the enemy is not interested in defending the terrain being crossed by our advancing formations, he attempts to delay our advance by skilfully employing mobile warfare tactics. The situation results in a number of skirmishes, which can only be halted by a rapid deployment of tanks and artillery. These forces have to be held at the ready in close proximity to our columns. The British usually open the battle by using their highly mobile artillery and heavy mortars (these are as effective as our light infantry gun) in long-range positions.

d) Combat

The enemy will let our attack approach as close as possible to his positions, which are masterfully camouflaged, before opening fire. He is tough opponent in combat, and his morale cannot be affected as easily as all those of other nations we have fought in the past. When facing a Stuka attack, at least in well-protected positions around Tobruk, he proved to be truly resilient, but is not so in the face of a large-scale attack by German tanks. The British tank crews tend to avoid a fight with our tanks at ranges under 300m; even the heavily armoured [Matilda] Mk II: our focus must be directed at destroying this tank. Effective defence weapons are the 5cm PaK and the PzKpfw III and PzKpfw IV firing armour-piercing and high-explosive shells (the latter had a great effect on the morale of our troops). A dangerous weapon is the 4cm

German forces had first fought the British Matilda II tank during the French campaign. The type had 80mm-thick armour which made it difficult to immobilize or destroy by anti-tank guns of the day. But the type mounted an Ordnance QF 2-Pounder gun which only fired armour-piercing shells, decreasing combat value.



Three Matilda II have been destroyed, possibly by long-range fire from 8.8cm FlaK. The open terrain made it easy to observe an attack by a large tank formation, much favoured by the British.

> [Ordnance QF 2-Pounder 'Portee'] mounted on a truck and often concealed by a tarpaulin which is removed shortly before opening fire. Also, the British have vast numbers of anti-tank rifles, but these are only effective against light armour or soft-skinned vehicles. The British, and especially the Australians, are excellent marksmen and fearless close-combat fighters. They fight hard in the trenches, but avoid combat against our tanks in open terrain.

Indeed, the British 8th Army frequently used the vastness of the North African landscape to lure many a German formation into a trap: a war of attrition had begun. The constant advance then retreat of desert warfare had a detrimental effect on German troops and mechanical breakdowns were a constant problem for the armoured forces.

In some aspects the situation resembled the strategy employed by the Soviet forces between 1941 and early 1943: Weaken the enemy you cannot defeat.

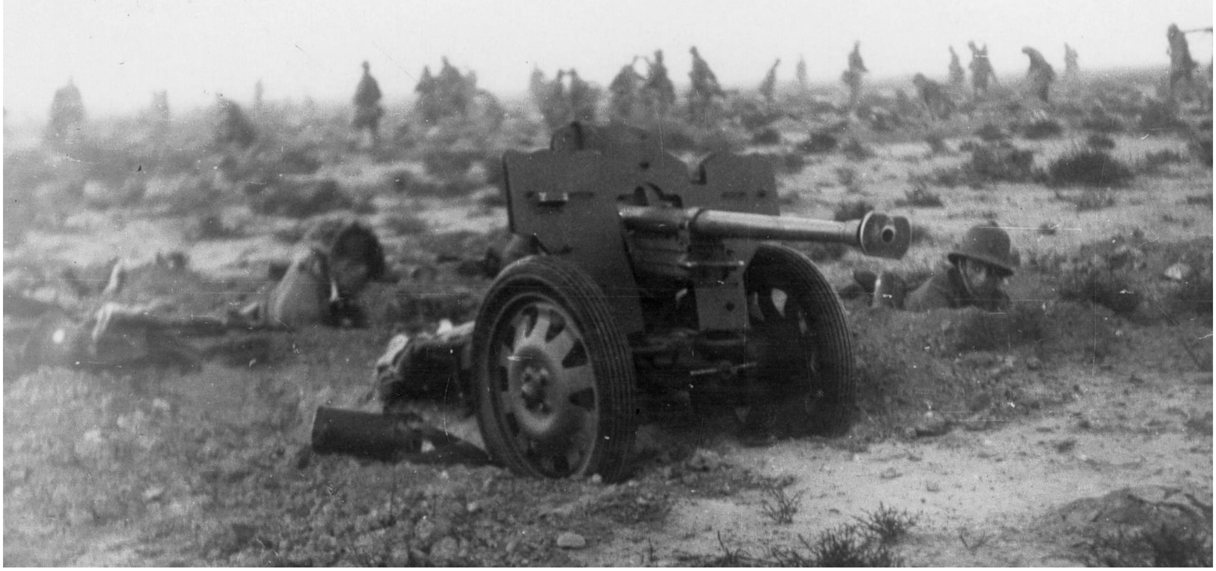
An addendum to the report details a number of problems with anti-tank weapons. On the 3.7cm PaK, the traverse and elevation gear proved to be extremely vulnerable to the ever-present desert sand. When towed by a motor vehicle, the resulting cloud of sand would coat mechanical parts causing wear and tear. Also the suspension system failed frequently when Luka 'bullet-proof' synthetic-rubber tyres were fitted.

A 5cm PaK 38 has been dug-in and well camouflaged as part of a *Panzerabwehr-Riegel* (anti-tank trap). In this environment, it would be virtually impossible to camouflage the gun tractor.

However, both the 4.7cm PaK(t) (mounted on the PzKpfw I) and the 5cm PaK gave no cause for complaints.

The report goes further into detail:

> Combat experience with the light 3.7cm PaK and medium 5cm PaK in North Africa.
> Effectiveness against enemy tanks, armoured cars, soft-skinned vehicles and MG-Träger [British-built Universal Carrier].
>
> 1) So far the few experiences we have had with the [Matilda] Mk II have been of little use. A captured Mk II had a concrete block fitted inside this already very well-armoured tank to protect the driver. The vehicle had been hit in the engine compartment. Also fire from a 3.7cm PaK had jammed the turret and damaged the tracks.
> 2) A number of light Cruiser Mark IVa were penetrated by the 5cm armour-piercing round at a range of between 700m and 1,100m. The explosive filling was destructive, and all the tanks burnt out after their ammunition storage was ignited.
> 3) The MG-Träger was engaged by both 3.7cm PaK and 5cm PaK with good results. Normally the first hit would destroy the vehicle. If the target was beyond the effective range of an armour-piercing shell, then a high-explosive shell proved to be effective, especially against the crew.
> 4) So far reconnaissance cars have only been destroyed by 5cm PaK. These fast moving but lightly armoured vehicles were usually hit at a range of 600m.



The 2.8cm s PzB 41 was first used in large numbers on the battlefields of North Africa. The weapon lacked long-range performance, but it had better performance than the 3.7cm PaK at more usual ranges.

5) Trucks and other support vehicles were destroyed by high-explosive rounds. Most caught fire.
6) Infantry targets such as machine-gun nests were also effectively engaged by firing high-explosive shells. The morale impact of our weapons was considerable.

The above assessment is not surprising. That the 5cm PaK 38 was superior to the 3.7cm is quite logical, but the supply of new guns continued at a very slow pace.

As a direct consequence the *Organisationsabteilung* ordered on 11 August 1941:

> Reinforcement of the anti-tank defence at the *Deutsches Afrika Korps* (DAK):
>
> The recent course of the fighting in North Africa has proved the absolute success of the tank, especially the heavy types. After the end of our assault which led to the recapture of the Cyrenaica, we have to expect an increase in the number of British forces and them preparing to launch an offensive. Therefore we must create a significant anti-tank defence.
>
> The *Chef Heeresrüstung* (chief of army equipment) and *Befehlshaber des Ersatzheeres* [BdE – commander of the replacement army] received orders from the OrgAbt to supply the following weapons to the DAK:
>
> a) A sufficient number of 5cm PaK to completely replace the 3.7cm PaK in the PzJgAbt of 15 and 21.PzDiv.

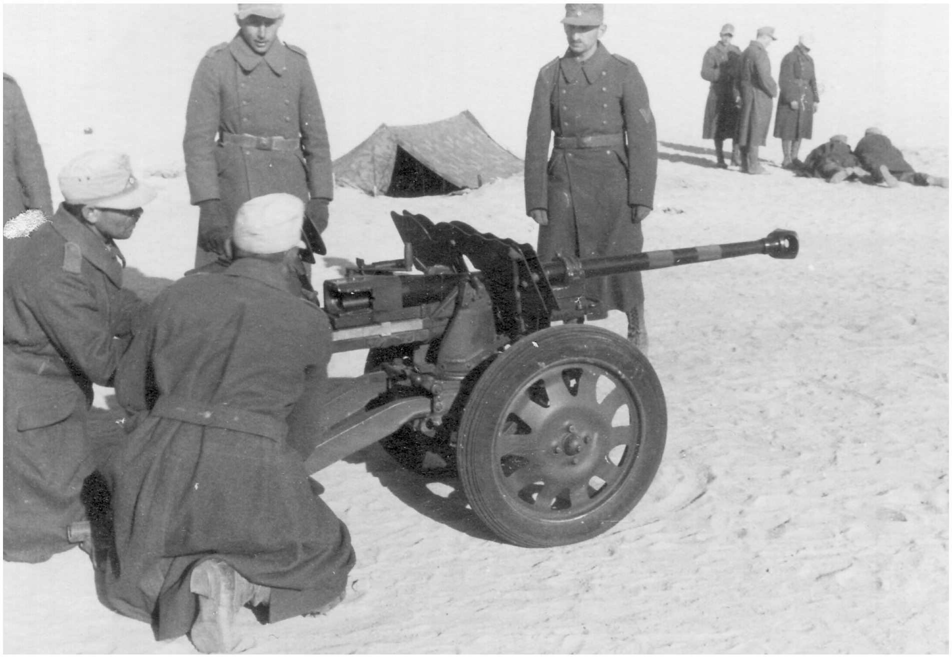
b) To re-equip the gun platoons of the light infantry in tank divisions with 5cm PaK.
c) Convert one platoon of the machine-gun battalion in a heavy company to the 5cm PaK, and complete the establishment of the PzJgKp in machine-gun Abt 8 (21.PzDiv).
d) The items listed below were supplied ahead of schedule:
20 – 5cm PaK 38
20 – s PzB 41
Any over supply will remain with the units as reserve.

The note, written before the Soviet T-34 and KV tanks were first encountered on the *Ost* (east) front, show that the 3.7cm PaK was considered to be obsolete. But, it must be remembered that troops of the forward infantry considered the gun as versatile and still of value. However, poor armour penetration performance made it obvious that they should be armed with better-performing weapons.

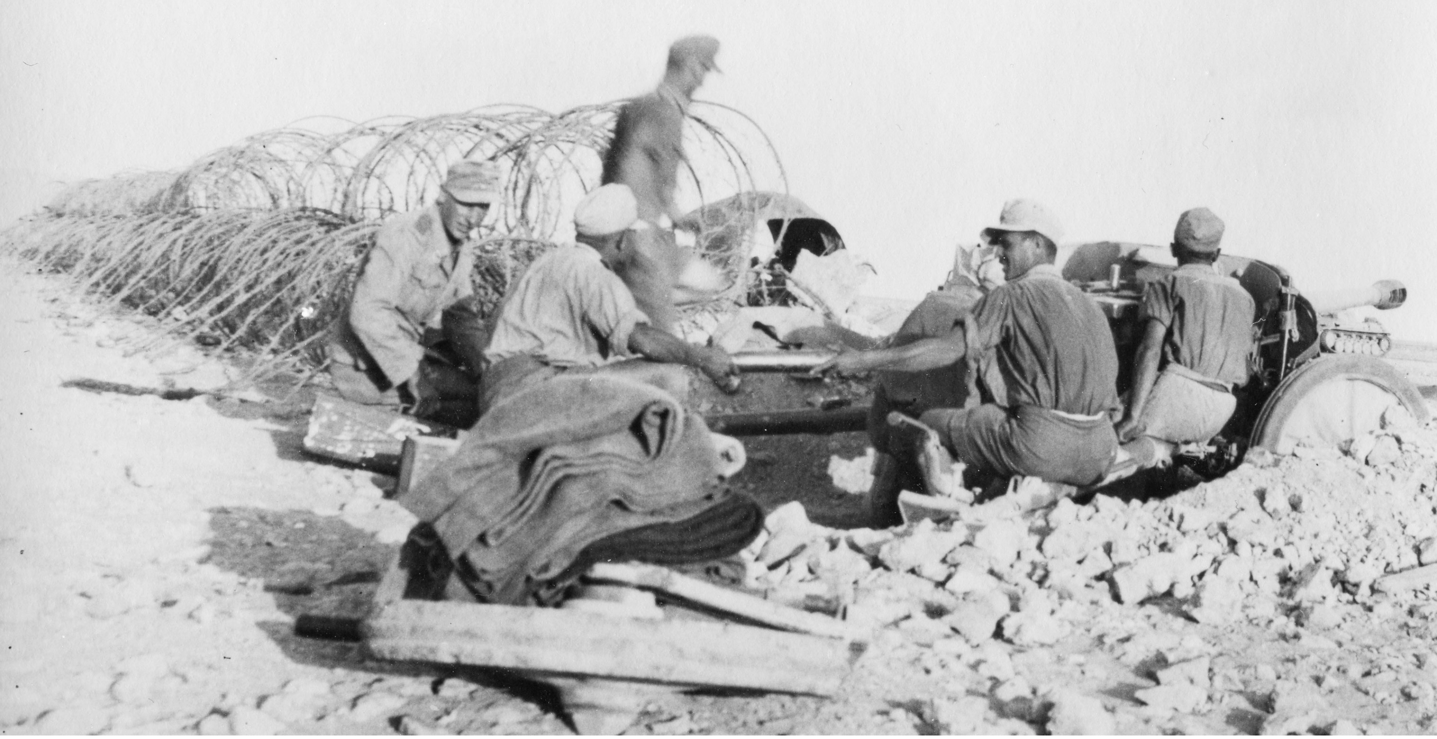
In the expectation of heavier British armour appearing on the battlefield in the near future, the OrgAbt began planning to issue more efficient anti-tank weapons, including the 5cm PaK 38 and the 2.8cm s PzB 41, to the DAK. By June 1941 a total of 183 guns had been delivered and this would increase to 298 by the end of the year.

On 2 October 1941, *Waffenprüfämet* (WaPrüf 2 – inspection infantry) sent a commission to North Africa.

An officer from the unit sent a short memorandum:



When mounted on the standard *Feldlafette* (field carriage), the gun could be towed by almost any motor vehicle, and also be easily pulled by the crew, allowing them to quickly change position during battle.



A 5cm PaK 38 positioned between coils of anti-infantry barbed wire. The gun was effective at up to 1,000m range against most British tanks except the Matilda II.
Attacking infantry could be effectively dealt with by firing high-explosive shells.

> After his return from a visit to front-line DAK positions at Sollum and Tobruk and also the *Technisches Versuchskommando* [TVK – technical proving command] camp at Jefren, Dr Hesselbach of WaPrüf 4 reported his following experiences regarding anti-tank defence:
> The DAK praises the following defensive weapons:
>
> – 8.8cm FlaK, able to open fire at 1,000 to 1,200m
> – 5cm PaK, 5cm KwK, opening fire at 400 to 800m
> – s PzB 41, opening fire at 100m
>
> The DAK regards the 3.7cm PaK as obsolete. However, the s PzB 41 was to be able to destroy an enemy tank with one shot at close range. The splinter damage to the interior was impressive.

In November 1941, *Organisationsabteilung* reported:

> The situation in the North African theatre calls for the quickest possible delivery of effective anti-tank weapons. Since the 2.8cm s PzB 41 demanded by *Panzergruppe Afrika* cannot be provided at present, we have authorized an allotment of 20 PaK 38 – escorted by one man – and 50 per cent of its 3.7cm standard ammunition stock. But, all attempts to organize delivery by air transport have been rejected.

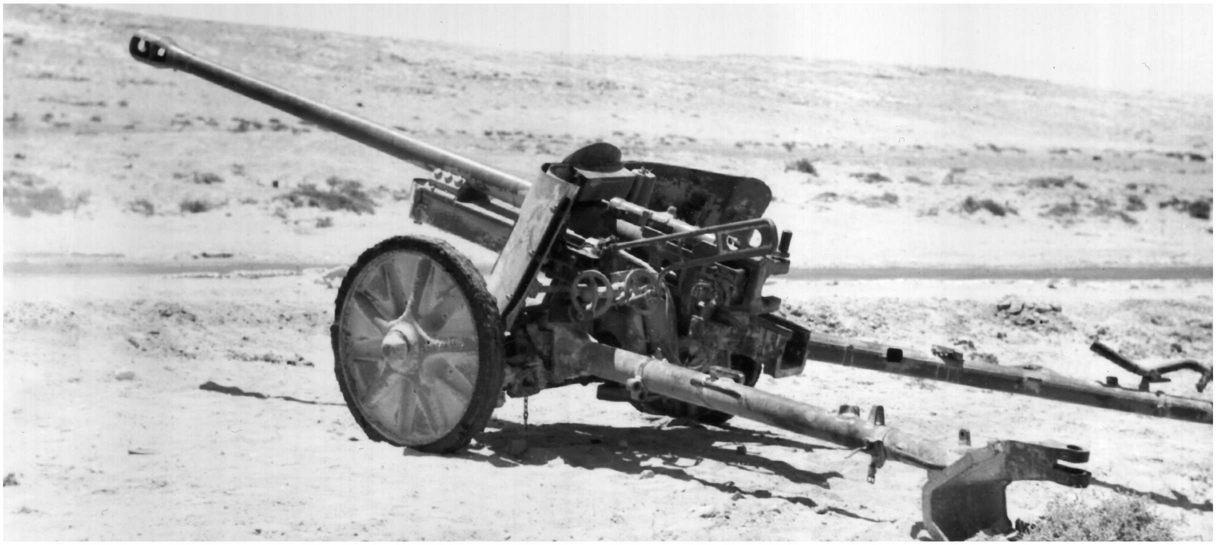
The note is evidence of the critical situation in North Africa, but even Rommel was not granted the urgently required equipment. The OrgAbt was even unable to deliver 20, a thoroughly manageable number, of the new 5cm PaK 38 to the DAK. Possibly the organization department was not able to send the guns due to the desperate situation for German troops fighting at the gates of Moscow.

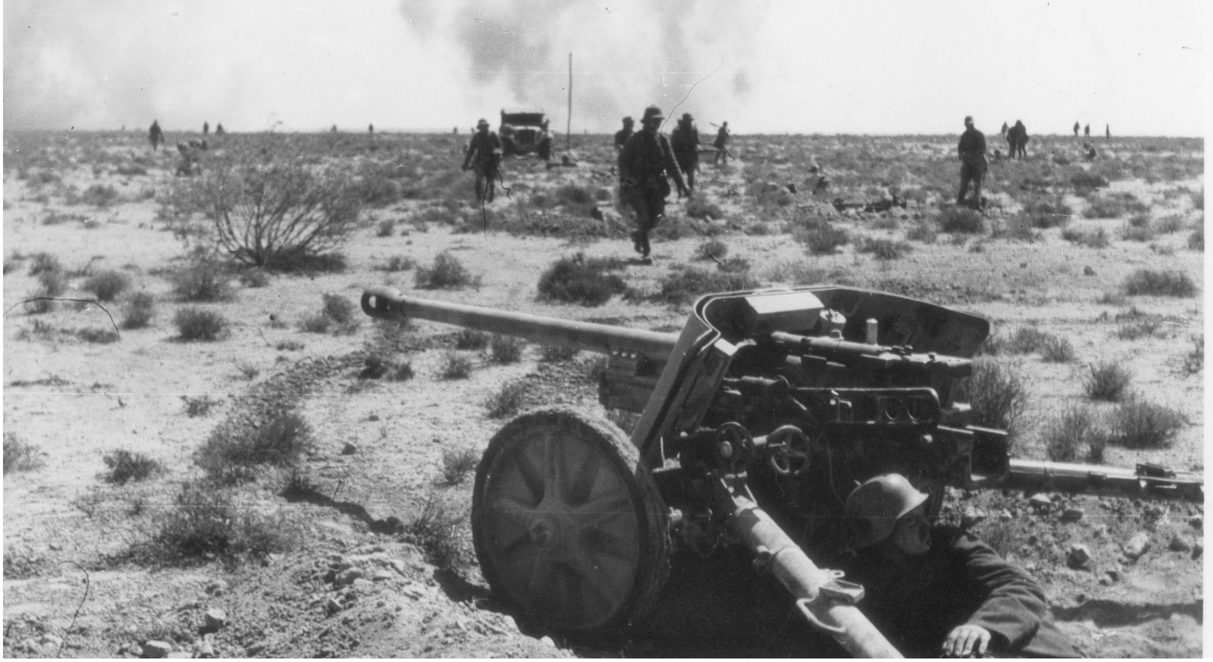
The note from the OrgAbt does not mention the most effective weapon against enemy tanks in desert combat: the 8.8cm FlaK.

The gun was a dedicated anti-aircraft weapon, and not highly thought of as a special purpose weapon. Due to the way gun was designed it was not suitable for pursuing a retreating enemy, or for defensive fighting: Official pamphlets produced to inform troops on how deploy the gun, warn of such hazards. Furthermore the team (tractor and gun) was not armoured, leaving the gun crew vulnerable to rifle fire and shrapnel. Also in an emergency situation it took precious time to bring the gun into action. On the other hand, the 8.8cm FlaK was highly accurate and deadly against a heavily-armoured tank.

Although the 8.8cm FlaK was deployed to good effect on the battlefields of North Africa and Russia between 1941 and 1942, one fact should never be forgotten: The German war machine was in a desperately poor state. Late development of better tank and anti-tank weapons, an overstretched armaments industry and also the lack of many vital raw materials all added up to cause a desperate shortage of new and replacement equipment. This forced German units to make best use of any available equipment; even that captured from the enemy.

The 5cm PaK 38 required a light truck to move around the battlefield as it was too heavy for the crew to haul. The wheels are fitted with bullet-proof tyres, but the heat of the desert had a detrimental effect on the rubber causing it to flake off.





The 5cm PaK 38 had a very low profile and was easier to conceal when dug-in. A double-layer gun shield has been fitted. The double-layer gunshield became a standard on the PaK 38 and PaK 40.

The reputation of the 8.8cm FlaK was further enhanced by British forces being unable (at least temporarily) to defeat the gun even when it was positioned in the open on a battlefield. However, the British began to confront the threat by deploying their excellent artillery and ground-attack aircraft.

An after-action report from 3./FlaK-Regiment 33 describes the successful deployment of heavy FlaK:

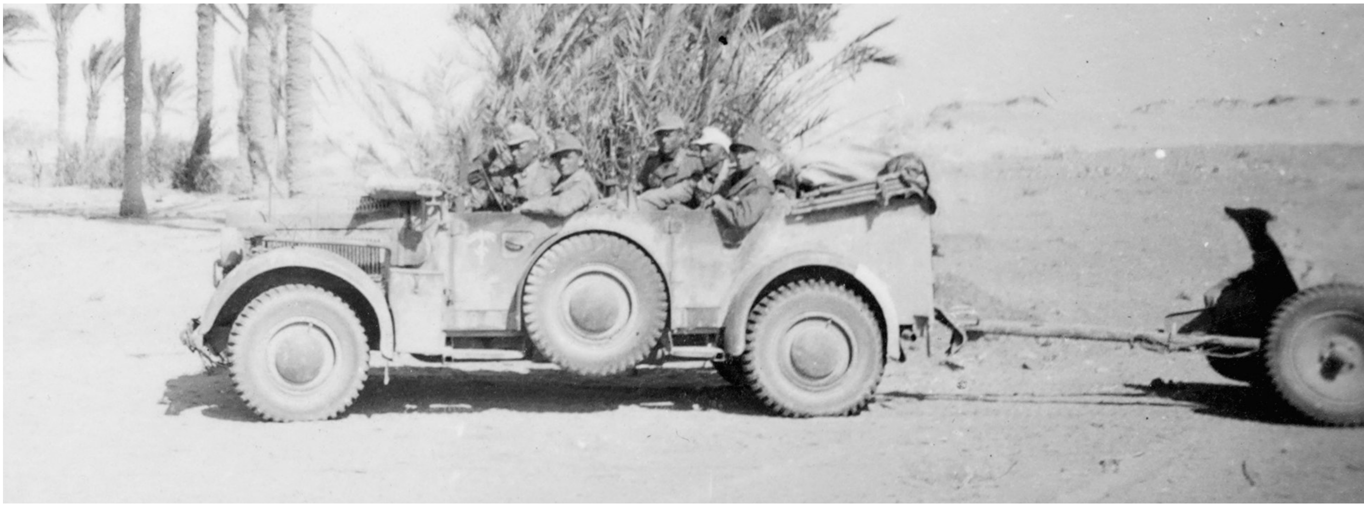
> After receiving the codeword '*Hochwasser*' (high water) on 19 November 1941, 3./FlaK-Rgt 33 was attached to PzRgt 8 in support of the tank attack as a *Panzer-Begleitbatterie* (escort battery) to defeat enemy tanks. After leaving the assembly area and later the alert area, first action took place on 20 November.
>
> The battery fought in the frontline with our tanks, firing at concentrations of enemy tanks and soft-skinned vehicle positioned near Bir el Barrani and Trigh el Abd. The fight was conducted at a range of some 2.5km, and pushed the enemy back to the west.
>
> Results: the impact of our fire could not be observed due to the long range.
> Ammunition consumption: 65 armour-piercing and 12 high-explosive rounds.
> Personnel losses: One killed, two wounded
> Material losses: None
>
> 21. November 1941
> During an attack on an enemy tank concentration at Point 193 near Bir Nbeidad,

the battery supported the advance by our tanks against British Mark IV tanks approaching from the right. Our tanks accomplished their mission undisturbed by the threat from the right. After an hour-long fight in the face of dogged enemy resistance the battery provided cover while I./PzRgt 8, which had run short of ammunition, retreated. The enemy tanks began advancing but were stopped by our well-aimed defensive fire allowing the *Panzer-Abteilung* to return to their starting point. Left alone on the battlefield, the battery came under fire from enemy machine guns and armoured cars. In this situation the battery changed positions and retreated to our own lines.

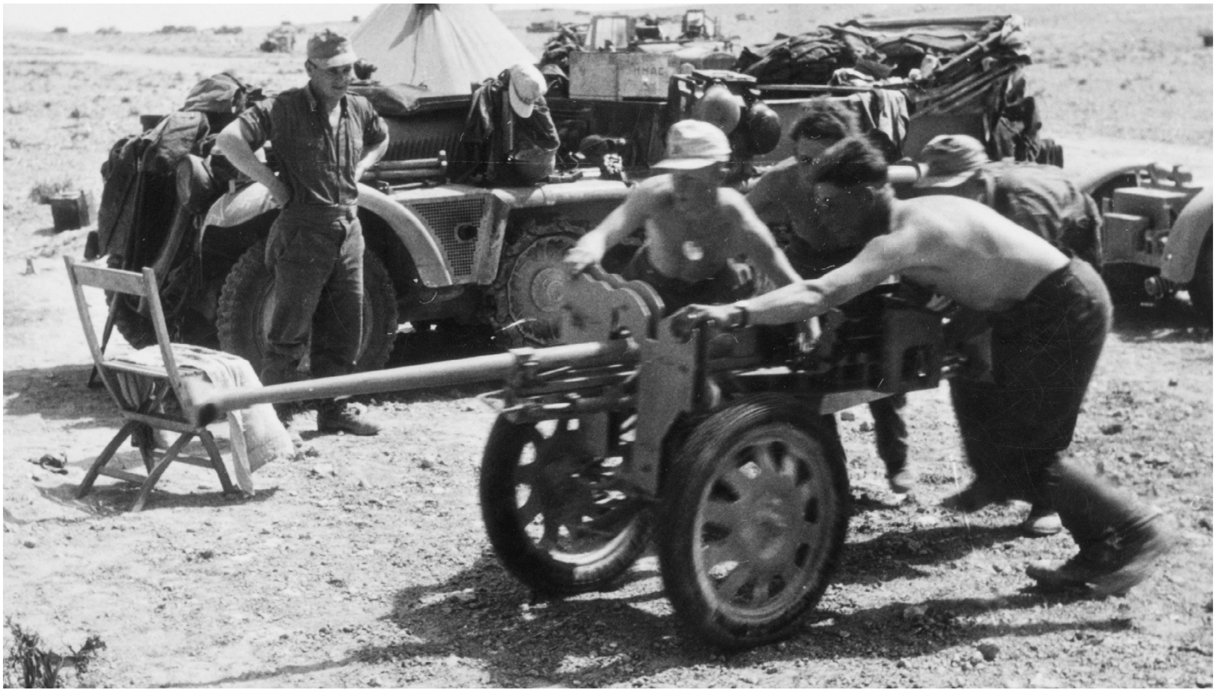
Results: Four Mark IV tanks destroyed
Ammunition consumption: 35 armour-piercing rounds
Personnel losses: One killed, two wounded
Material losses: None

23. Nov 1941, morning
Around 20km southeast of El Adem, two 8.8cm FlaK of the battery (positioned to the left and right side of the tank formation) attacked enemy tank concentrations, a truck column and infantry. Our tank attack was effectively supported by firing 8.8cm high-explosive shells (air burst) and fire from 2cm FlaK. The enemy retreated, leaving many prisoners behind.

Results: Four Mk IV and 20 trucks destroyed
Ammunition consumption: 61 armour-piercing rounds, 21 high-explosive rounds (impact fuse), 25 with time fuse.
Losses: None



A Horch Kfz 12 towing a 3.7cm PaK: Note the driver has folded the windscreen down and packed it in a protective cover to prevent it reflecting sunlight.



This 2.8cm s PzB 41 has been towed into position by an SdKfz 10 half-track tractor – the trailer can be seen behind the tractor.

> 25 November 1941
> During night march toward the south-east side of Sidi Omar, at around 13:00hrs the lead Panzer drove into a column of British tanks, accompanied by infantry in trucks. In the ensuing fight, a Mark IV and several trucks were destroyed by our *leichter FlaK-Truppe* (light anti-aircraft section). After reaching the town, the division turned north-northwest towards Sidi Azeiz. Some 20km north of Sidi Omar, a British tank battalion attempted to hold up the advance of the division. In the following fight, the battery attacked 16 Mk II [Matilda II] and one Mk IV; none of the enemy tanks was able to get away. The battery had ensured that it was safe for the division.
>
> Results: A total of 16 Mk II [Matilda] and one Mk IV tanks destroyed. One RAF Hurricane fighter was shot down by 2cm FlaK
> Ammunition consumption: 162 armour-piercing rounds, 28 high-explosive rounds (impact fuse)
> Personnel losses: Two men killed, two wounded

The report shows how heavy FlaK could be effectively deployed; carefully pulled forward, often directly in front of tank formations, the accurate fire from the 8.8cm FlaK could be bought to bear with deadly effect. While the British Mk IV Cruiser tanks were no match, the destruction of 16 Infantry Tank Mk II (Matilda II) is evidence of how effective the gun was as an anti-tank weapon.

The Invasion of Crete

11

British military planners considered the island of Crete to be of strategic importance for the supply and defence of bases in Malta and Egypt. In late 1940, the British began to deploy forces to the island and a garrison had been established by February 1941, and men of the Royal Engineers had constructed three airfields for the RAF. When German troops marched into Athens on 27 April, British forces continued their withdrawal from the Greek mainland and a small number were transferred to Crete.

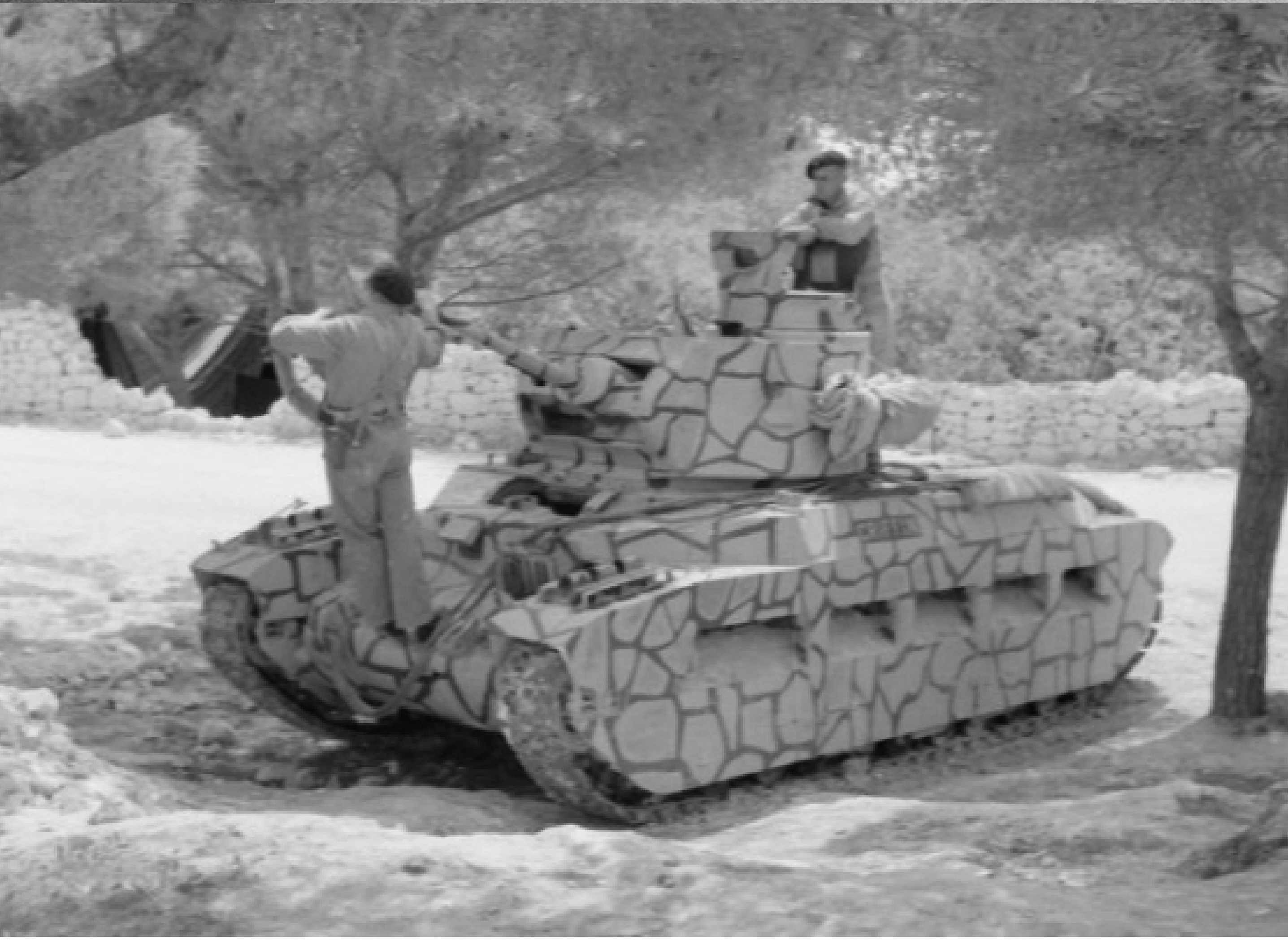
However, Adolf Hitler had already ordered his commanders to plan *Unternehmen* Merkur (Operation *Mercury*) the invasion of Crete. Although the Royal Navy domination of the Mediterranean Sea made a naval landing impossible, the *Luftwaffe* did hold air supremacy. German planners made a difficult decision – only *Luftwaffe* and *Fallschirmjäger* (paratroops) units were to be used for the invasion. The 5.Gebirgsdivision (mountain division) was to be held in reserve to support the invasion force.

The Attack

As dawn broke on 27 May, the first *Fallschirmjäger* landed and immediately faced two serious problems: where was the firepower to fight enemy fortified positions; and how would they defeat enemy tanks.

The British garrison was equipped with a few light tanks and a number of heavier Infantry Tank Mk II (Matilda II). However, due to insufficient numbers, these tanks would not play a significant role in the fighting, as the main battle was fought by British, New Zealand and Greek infantry.

For *Unternehmen* Merkur (Operation *Mercury*), the invasion of Crete, light air-portable weapons were a fundamental prerequisite to provide fire support. Here *Gebirgsjäger* (mountain troops) are practice firing with a 2.8cm s PzB 41. The gun is fitted on a *leichte Feldlafette* (light field mounting).



The British garrison on Crete had a number of tanks at their disposal including a number of Infantry Tank Mk II (Matilda II). Note the tank has been painted in stone wall camouflage scheme. (Imperial War Museum GM836)

The attack by the 7.Fliegerdivision (the only German airborne unit) was equipped with the standard 3.7cm PaK anti-tank gun – in 1941 the gun continued to be considered as a potent multi-purpose weapon. For airborne operations, the gun and parachute were packed in a special cradle and mounted (between the undercarriage legs) under the fuselage of a Junkers Ju-52, the most numerous German transport aircraft. On reaching the drop zone the cradle would be released and parachuted to troops on the battlefield.

The 3.7cm PaK weighed approximately 435kg, light enough to be moved over short distances by the crew. However, a greater distance would require a towing vehicle, and these were not available during the early stages of the invasion.

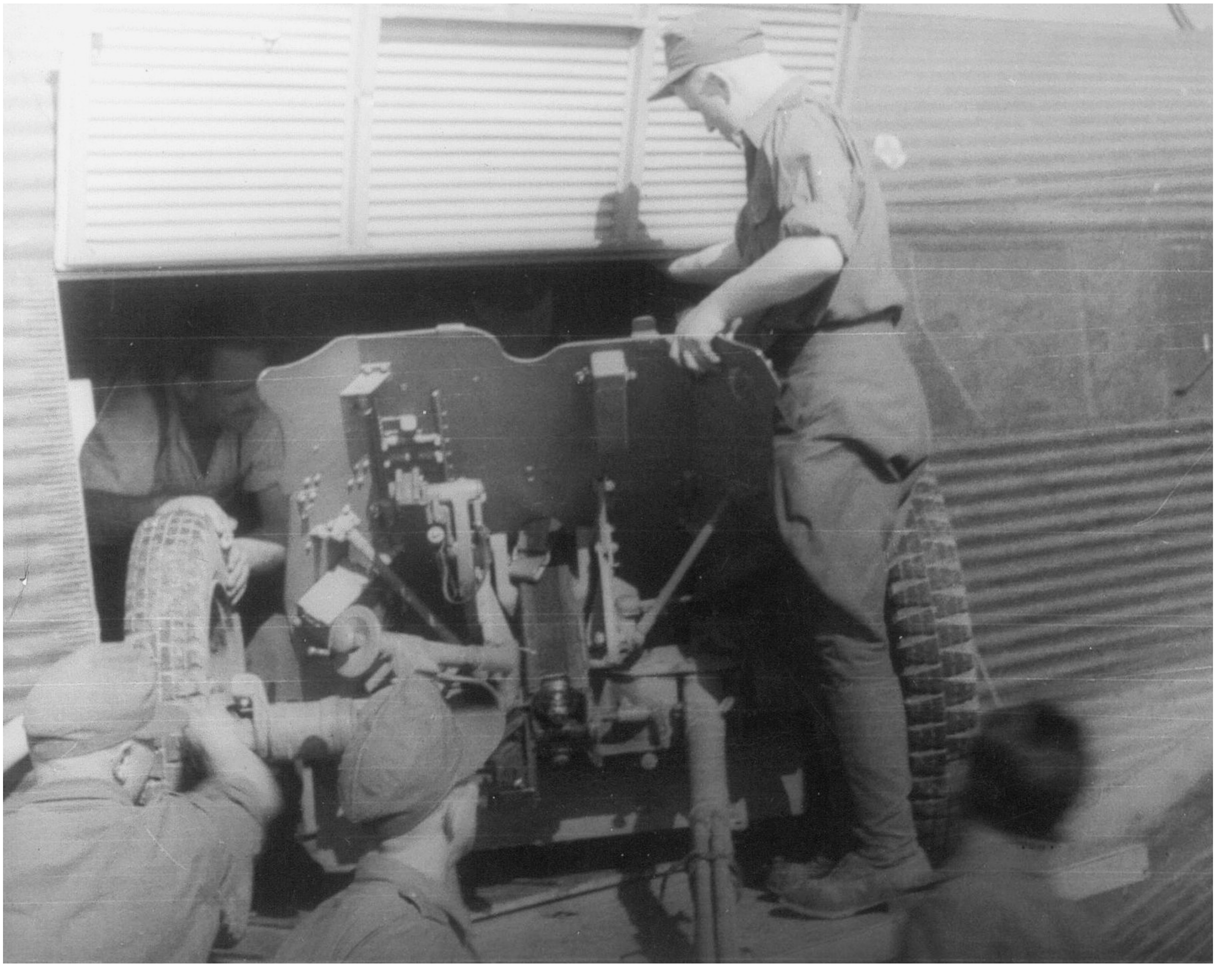
The same also applied to the 2.8cm heavy Panzerbüchse (PzB). Although lighter (147kg), again a longer distance would require a towing vehicle or a pair of horses. The gun had good armour-piercing performance, but had little effect when it was used to fire high-explosive rounds at enemy troops in dug-in positions.

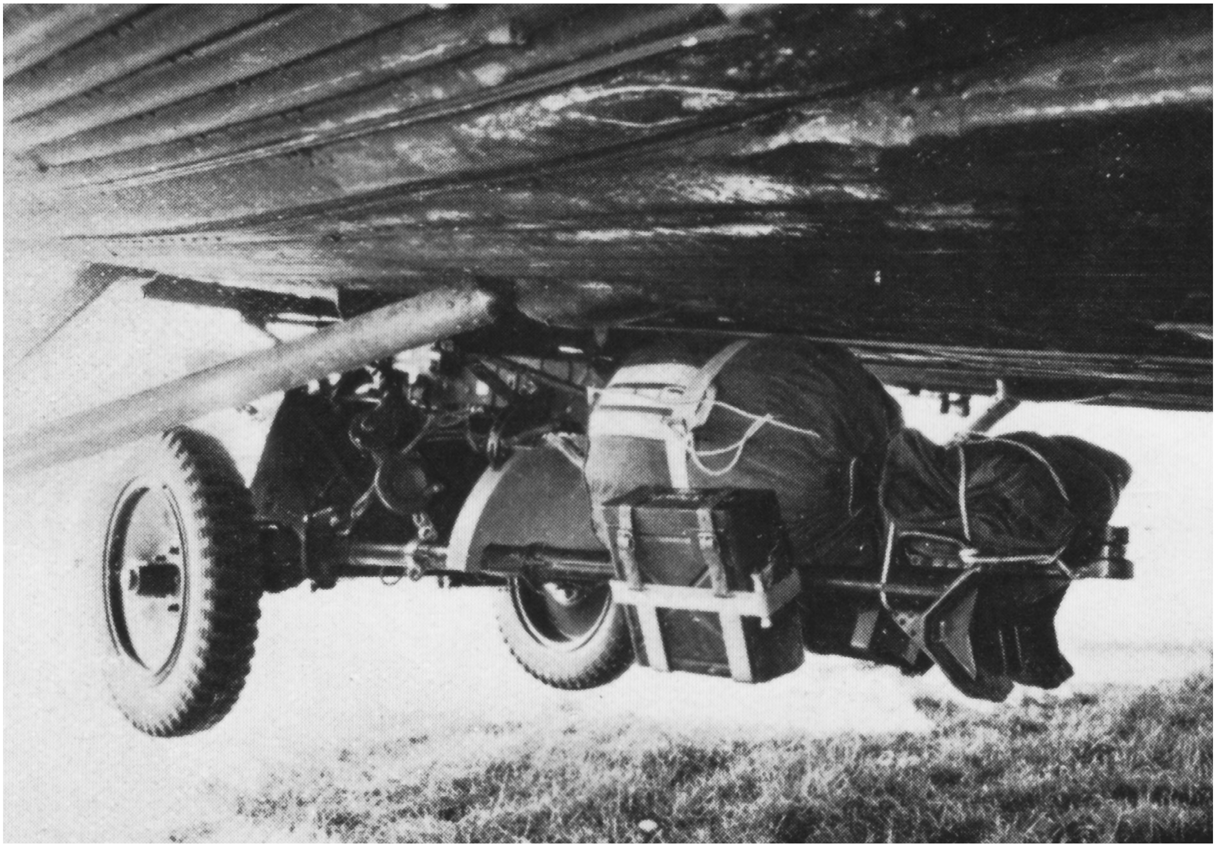
In 1941 the PzB 39, a small man-portable anti-tank weapon, was being delivered to front-line units at a slow pace. German airborne forces now had a lightweight anti-tank rifle to attack enemy armour. The gun was most certainly used by *Fallschirmjäger* in Crete, but no further information or combat reports have been found to confirm its use during the battle for the island.

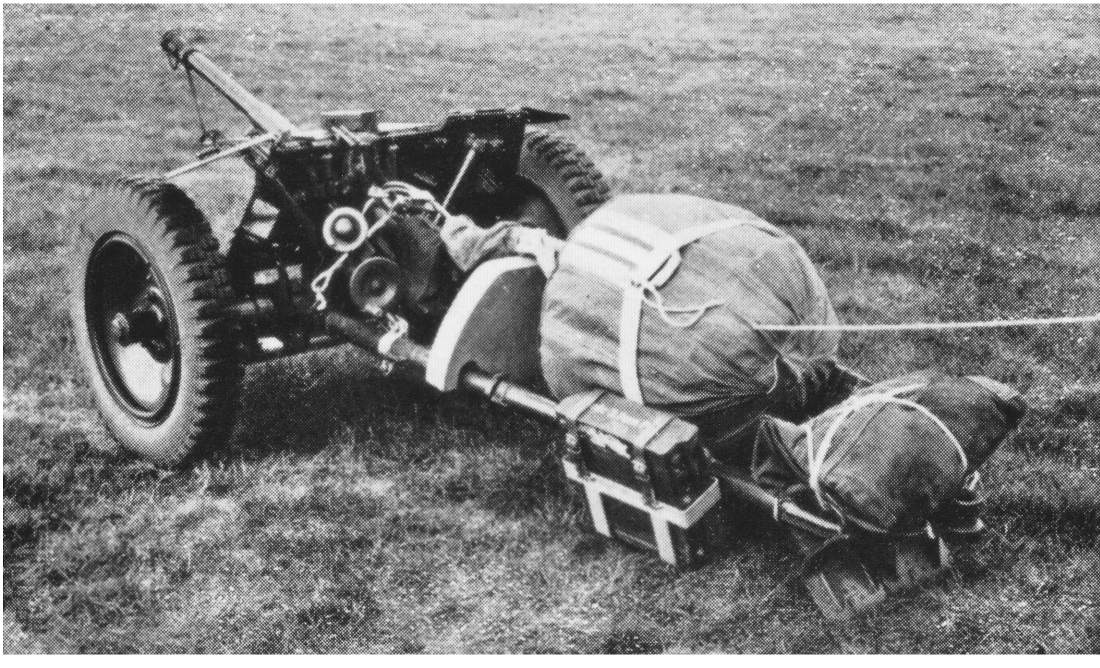
Before the 5.Gebirgsdivision landed on the island, the only 'heavy' weapon available was the 8cm *Granatewerfer* (grenade launcher) 34 (with shortened barrel). However, there was a new weapon which was to be used in combat during the battle for Crete.

In the years running up to World War II, much new technology had been developed and perfected. One result was the *Leichtgeschütz*, (LG –

The transport of light and medium weapons for the *Gebirgsjäger* was of vital importance. Although a number of 3.7cm PaK were air dropped, the light and compact gun could be carried in a Junkers Ju-52 transport aircraft.

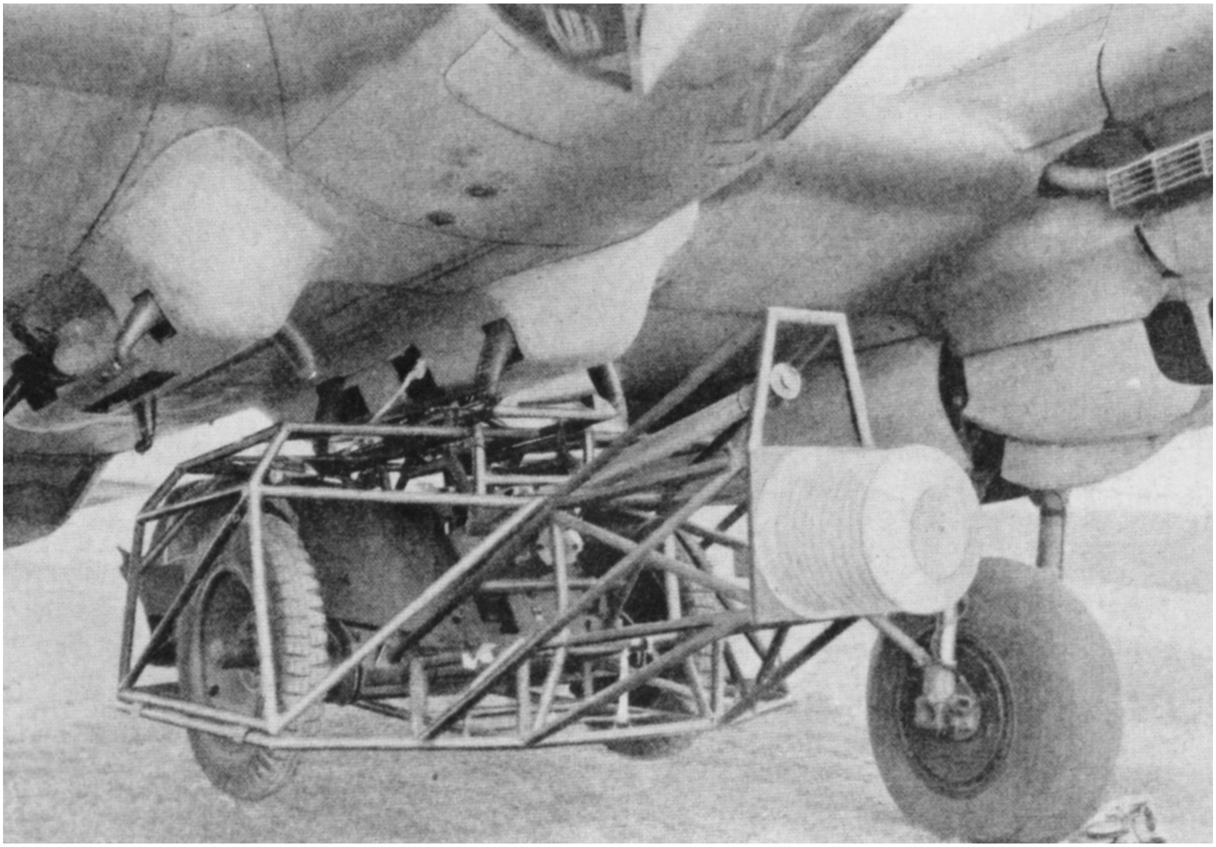






Above: A 3.7cm PaK loaded under the fuselage (between the main wheels) of a Junkers Ju-52.

Left: To prepare the 3.7cm PaK for air-dropping from a Junkers Ju-52, the gun shield had to be folded and a special wooden strut fitted to keep the breech closed and the split trails together; two ammunition boxes were strapped to the trails. The parachute was fitted at the back and attached to three points on the gun.



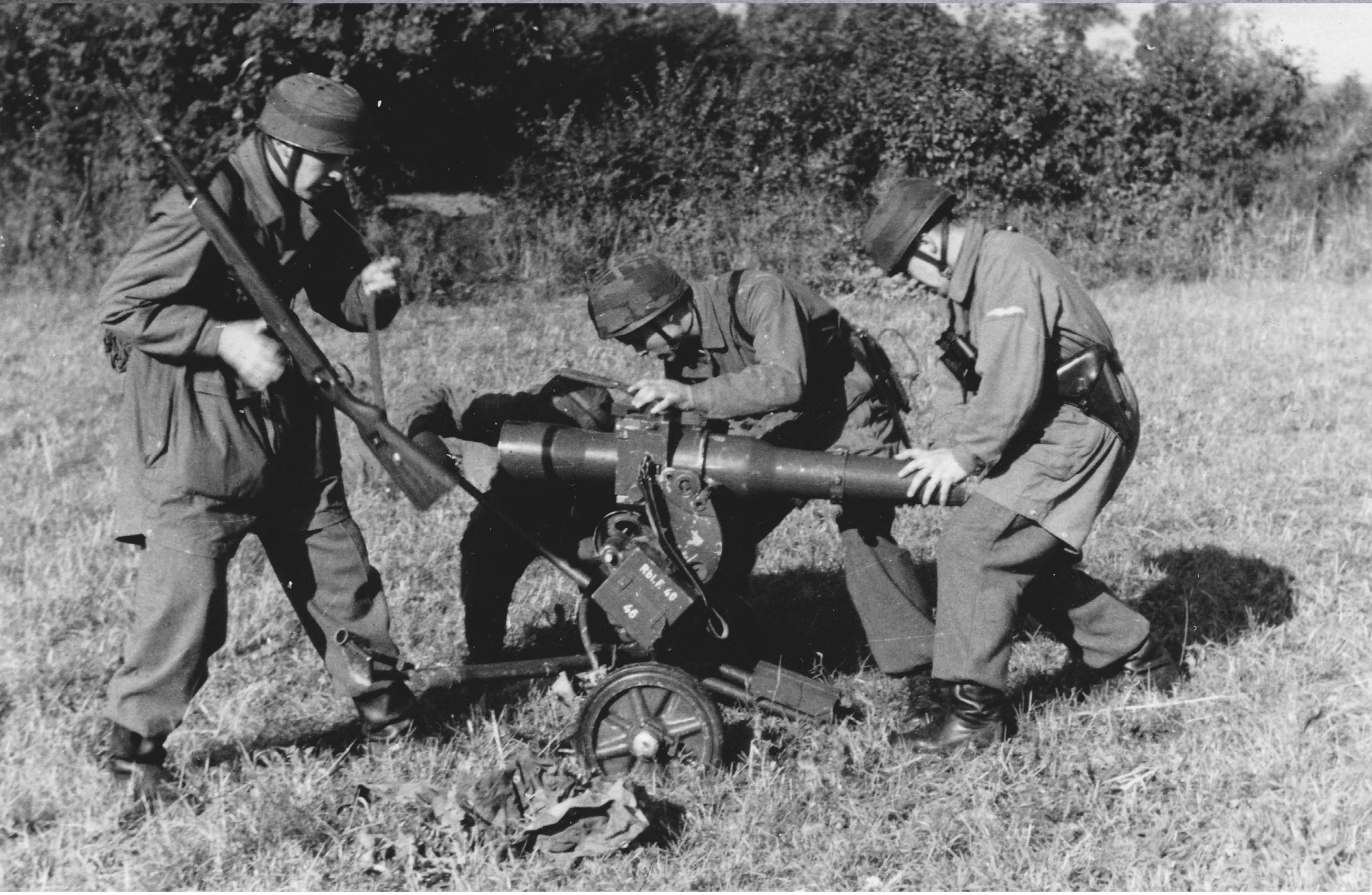
The heavier 4.2cm PaK 41 was packed in a specially-fabricated protective cradle and carried under the bomb bay of a Heinkel He-111. The cradle was attached by cables to bomb carriers inside the bay.

recoilless gun), which appeared to fulfil the aim of creating a lightweight heavy-calibre weapon.

The basic workings of a recoilless gun is to fire identical (powder) charges in opposing directions; although this would eliminate any recoil it would be of no practical use. As a logical advancement of this idea, part of the explosive gases would be redirected to produce a counterforce: the remaining (larger proportion) of gases then propelled the shell. Armaments manufacturer Rheinmetall, first attempted using this technique to design weapons for fighter aircraft, but in 1937 began development of an artillery gun using the same technology.

Trials of the first prototype were successful and development continued until the 7.5cm LG 1 entered production. When the gun entered service it was designated as the LG 40. Interestingly, the gun was mounted on a foldable tripod-type carriage, which could be fitted two small wheels making it easy for the crew to pull.

The 7.5cm calibre of the LG 40 made it an effective weapon. The gun fired two existing types of ammunition used on other German artillery



Three *Fallschirmjäger* check their *Leichtgeschütz* 40 (LG 40) recoilless gun before going into action. The gun weighed 200kg and could easily be moved by the two-man crew; the small wheels would hinder mobility over rough or muddy terrain.

pieces (other nations would later develop specialized ammunition for a recoilless gun). The 7.5cm Gr 34 high-explosive round was used for the 7.5cm *Gebirgsgeschütz* (GbG – mountain gun) 36. The chosen armour-piercing round to defeat enemy armour was the 7.5cm Kopf-Granate *rot* (KGr r) originally supplied for the 7.5cm Fk 16 (n A) from World War I. A German file dating from 1941, notes that the 7.5cm KGr (*rot*) shell could penetrate armour 62mm thick at 100m and 58mm at 1,000m range. The penetration data was possibly less due to it having a significantly lower (305 against 630mps) muzzle velocity. To improve performance a hollow-charge round was introduced.

The 7.5cm Gr 38 Hl/A, hollow charge armour-piercing round which could penetrate 70mm thick armour at all effective ranges, was introduced for the LG 40 in late 1941. This was followed by the more powerful 7.5cm Gr 38 Hl/B which could penetrate armour 75mm thick.

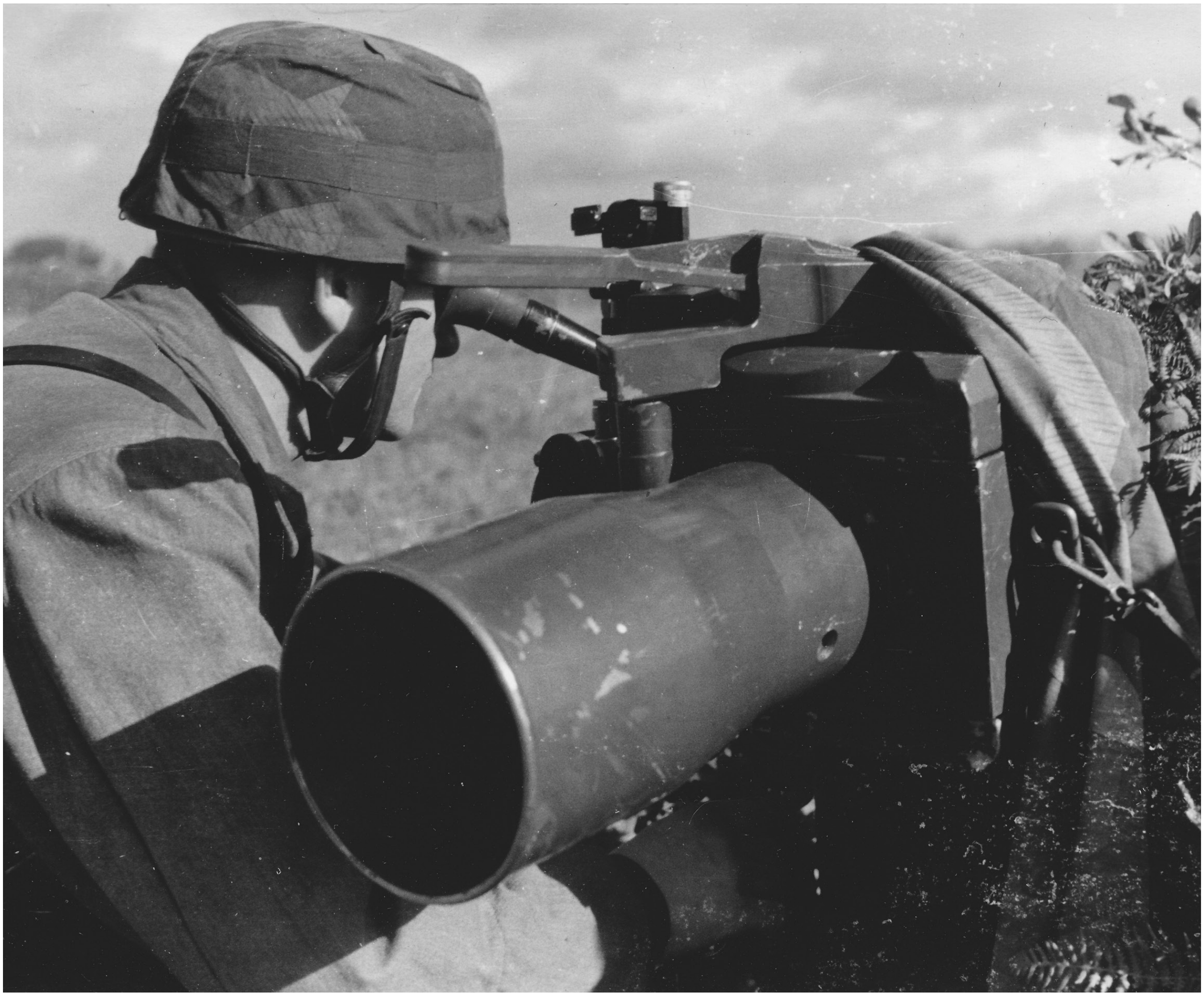
The LG 40 was firstly used in combat for the invasion of Crete, but the number issued to airborne units remains unknown. Sadly, no combat reports from troops equipped with the LG 40 recoilless gun have been found.

7.5cm LG 40, Data

Calibre	7.50cm
Barrel length	1147mm = L/15.3
Maximum range	c.6200m
Muzzle velocity	305m/s*
Side traverse	360°
Elevation range	-15 to + 65°
Rate of fire	unknown
Weight in firing position	146kg
Weight in travelling position	207kg
Armour penetration at 100m*	62mm
Armour penetration at 1,000m*	58mm

* 7.5cm KGr (*rot*), the 7.5cm HL/A was not available until December 1941

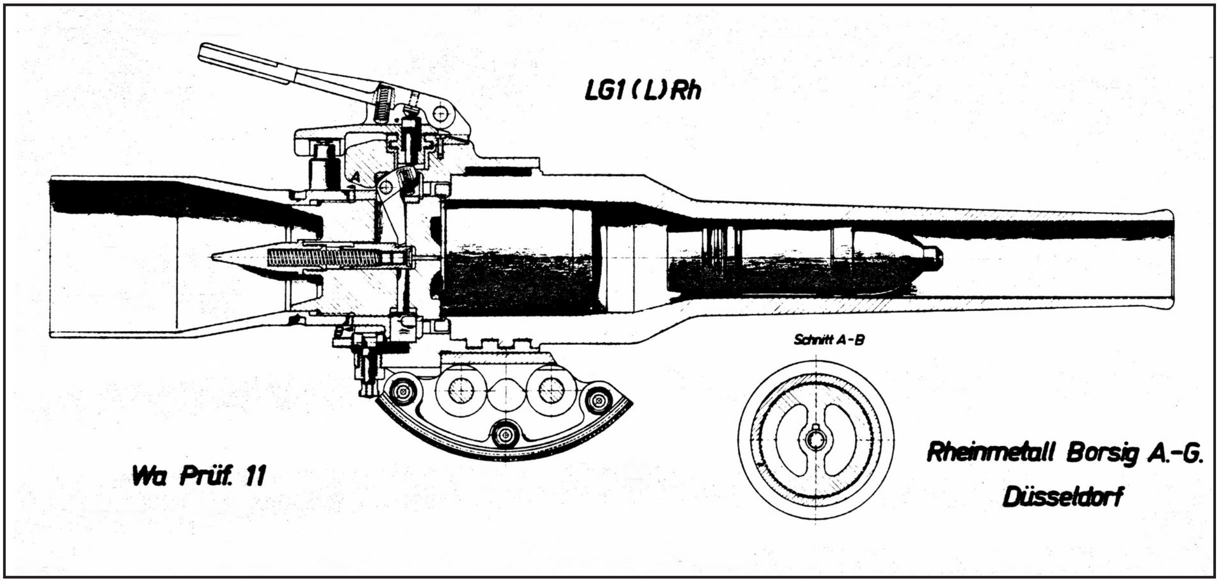
In action, the gunner would use a *Zieleinrichtung* LG gun sight to aim at the target. When in action, gunner and loader had keep away from the back of the gun to avoid the blast as the weapon fired.



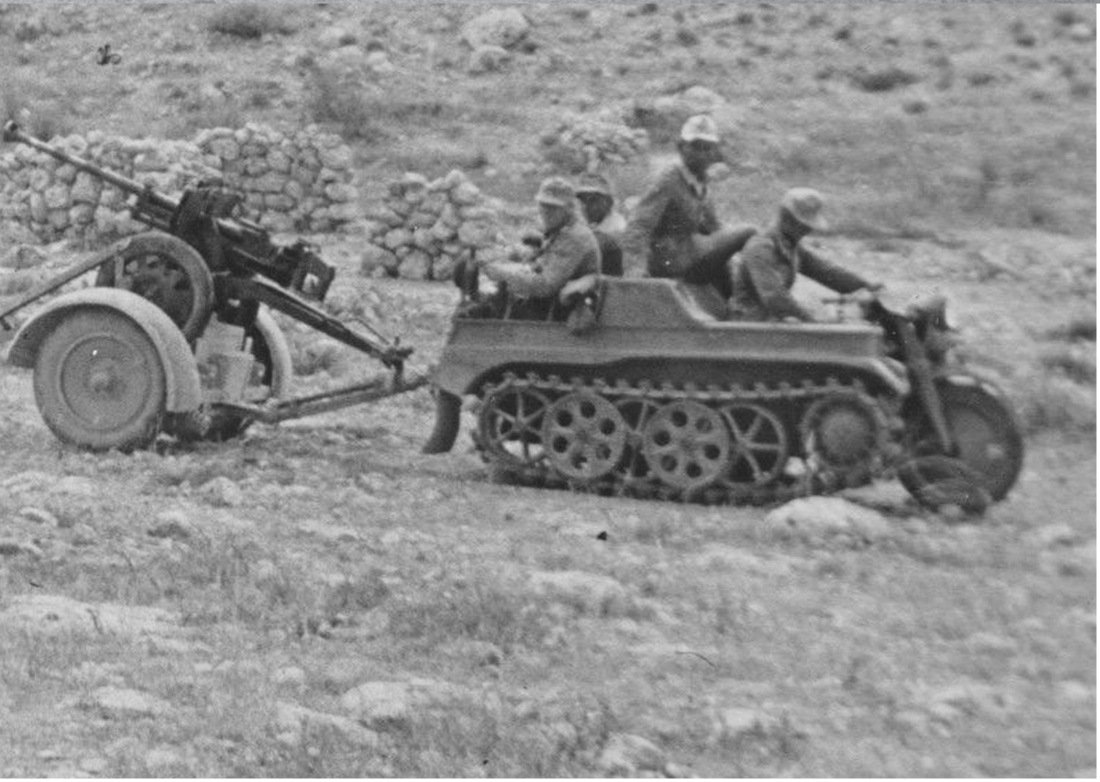
Unlike other anti-tank guns the 2.8cm s PzB 41 was not fitted with a traverse or elevation mechanism, aiming was managed manually using the massive handles.

The true value of this weapon is revealed when comparing it to the 7.5cm le IG 18, light infantry gun, which weighed 405kg (horse drawn) and 515kg (vehicle towed): the 7.5cm LG 40 was over 50 per cent lighter.

On 1 June 1941, the defenders of Crete were withdrawn to Egypt: The Battle of Crete was over and the island was in German hands, but the fight



A cross section of the 7.5cm LG 40 produced by Rheinmetall-Borsig. The very large propellant charge would accelerate the projectile to only 305mps; an explanation for the limited range and accuracy. But the charge produced a very hot and powerful blast from the breech.



The 2.8cm s PzB 41 could be towed by *kleines Kettenkraftrad* (SdKfz 2) by placing it on a two-wheel trailer. A second SdKfz 2 would tow a trailer carrying ammunition.

against a numerically superior enemy came at heavy cost in lives; a total of 2,000 German soldiers fell during *Unternehmen* Merkur. This was due in part to the dogged resistance put up by defending troops using the Cretan landscape to their advantage.

After the operation had ended, the OKH decided to re-establish the battle-worn 7.Fliegerdivision, but the unit would never again be deployed for a large-scale airborne landing.

As the war progressed, the 7.5cm LG 40 and later the heavier 10.5cm LG 40 were also supplied to German mountain divisions.

The *Leichtgeschütze* proved to be the ideal weapon which provided the light infantry with desperately needed extra firepower. However, there were two serious problems for crews operating the LG 40. Firstly, the rearward blast of toxic propellant fumes made it absolutely necessary for the crew to leave the back of the gun. Secondly, the muzzle blast produced a large cloud of dust which easily revealed the position gun. This problem was solved by changing the shell propellant to minimize muzzle blast.

Although Crete had been captured, Hitler decided not to invade Malta, but instead ordered the *Luftwaffe* to bomb the island into submission. However, the island resisted and this allowed the British to continue operations against shipping and air transport delivering vital supplies to German forces in North Africa.

The Invasion of Russia

12

On 22 June 1941, the German Reich launched the long-planned *Unternehmen* Barbarossa; the invasion of Russia. Hitler assumed that what he thought was a somewhat backward empire, despite its enormous size, would collapse after a determined strike by his well-equipped forces employing battle-proven tactics. The main aim was to capture Moscow, the capital of the Soviet Union, before the onset of the harsh Russian winter.

Soviet Tank Forces

History would show that the campaign was to take a different course. During the first months of the operation the German armoured spearhead, led by the *Panzerwaffe* and supporting *Panzerjäger* units, had in the main to fight massed formations of fast, but lightly armoured Soviet tanks.

During the 1930s, the Soviet army decided in principle to adopt a two-tier approach to the deployment of their tank forces.

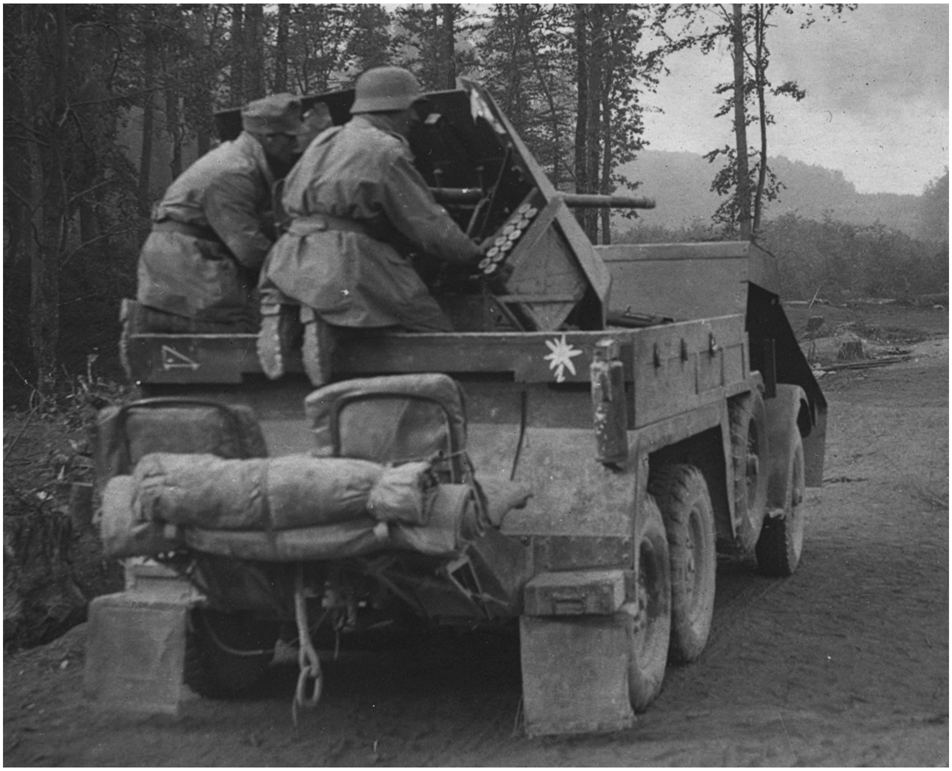
The T-26, developed from the British-built Vickers 6-Ton (Vickers Mark E) tank, was used in the role of a slow-moving infantry-support tank, while the BT-5 and BT-7 were deployed as fast-moving cavalry tanks. To simplify production, both types were fitted with the same turret and mounted the 45mm tank gun, which fired high-explosive (HE) and armour-piercing (AP) shells of average performance.

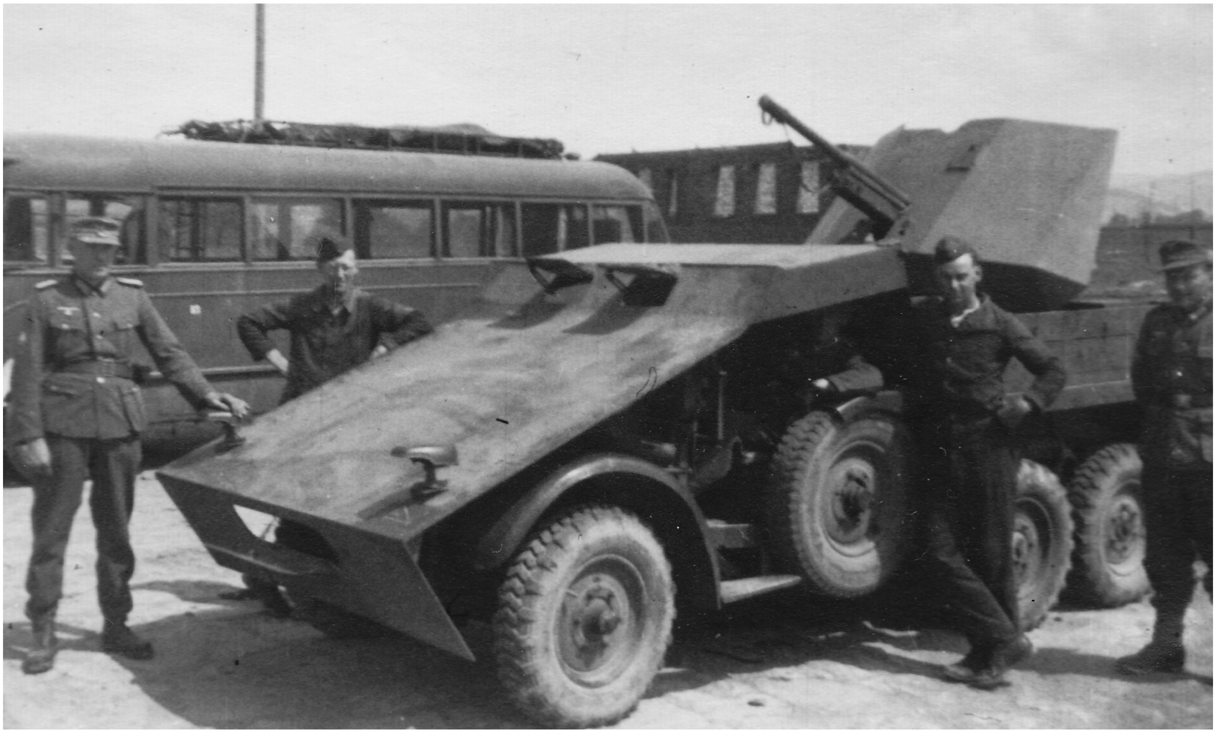
The armour on both the T-26 and the BT-5 was weak (16mm thick) and only gave limited protection for the crew; the armour on the BT-7 was increased to 22mm. Designed long before outbreak of World War II, the armour on all three

In Russia, the German forces had to deal with long distances and very poor road conditions. To overcome any problems when towing an anti-tank gun, many units simply loaded their guns onto a vehicle. Here a 3.7cm PaK is being carried on Krupp Protzkraftwagen (SdKfz 69).

Right: To mount the 3.7cm PaK on the cargo bed of an SdKfz 69 a new type of gun shield, with an attached ammunition rack, had to be fitted.

Below: German engineers have fabricated a sloping armour plate to provide the driver of this SdKfz 69 with some protection from infantry fire.





types could easily be penetrated by concentrated fire from a heavy machine gun, anti-tank rifle and almost all contemporary anti-tank guns.

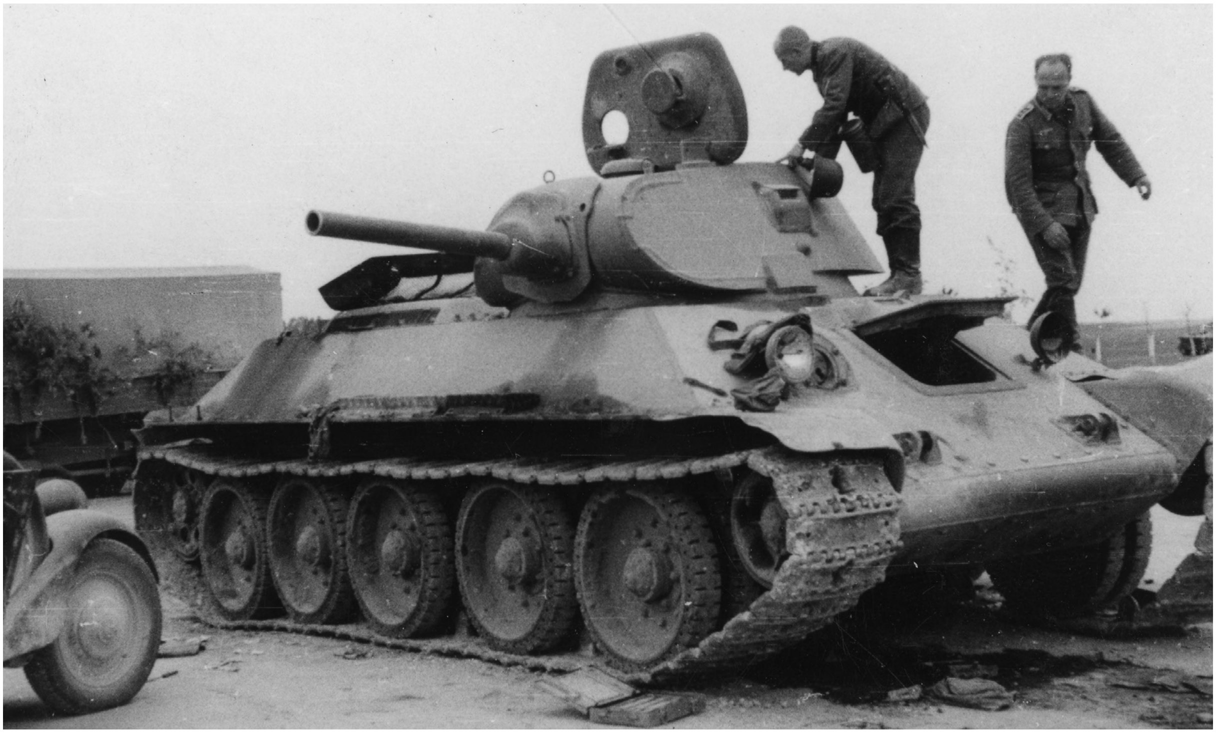
Many German soldiers who had served in the Condor Legion had fought the T-26 and BT-5 during the Spanish Civil War, were aware that their current anti-tank equipment could defeat both types.

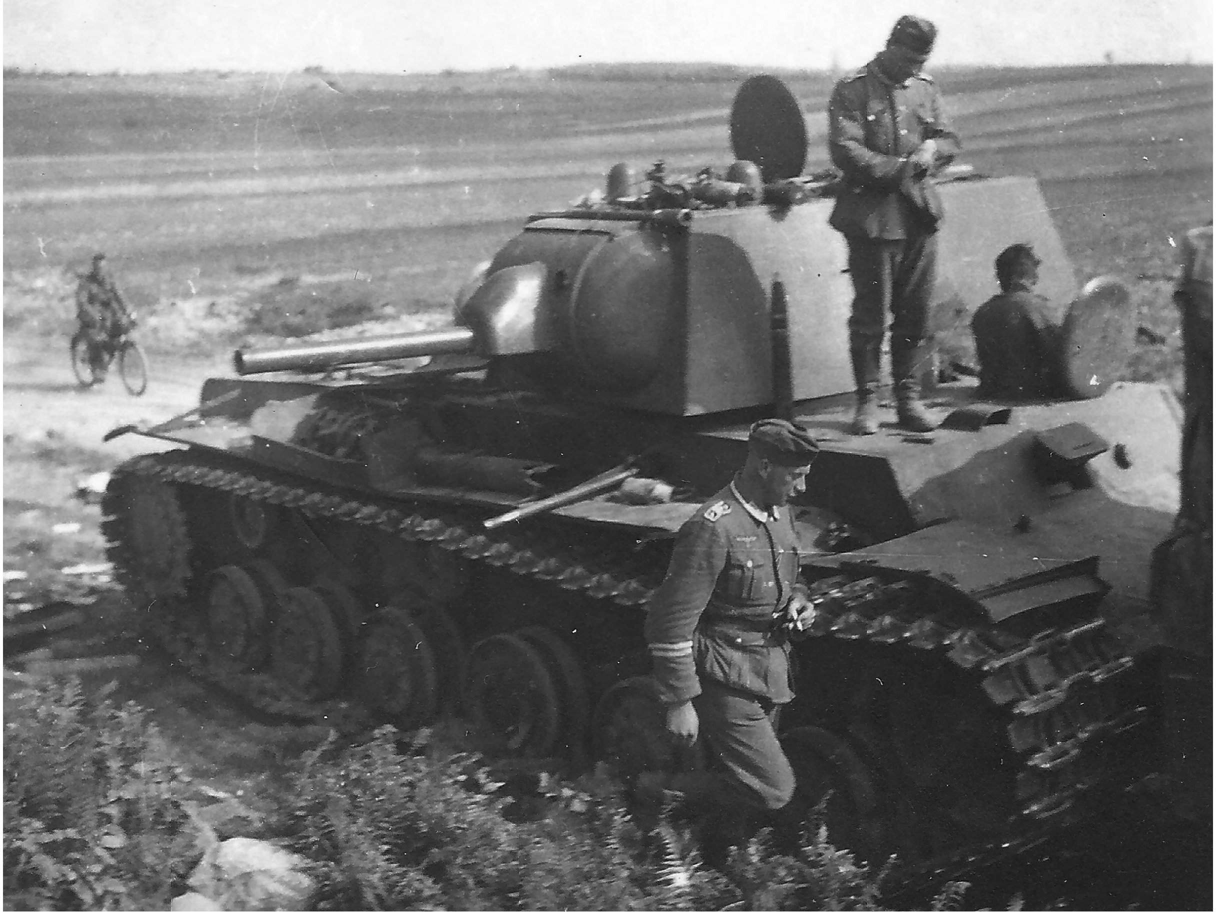
Two other types, the T-28 and T-35, completed the main body of the Red Army's tank force. Both were multi-turreted tanks, based on the 'land ship' concept first seen on the British-built Vickers Independent A1E1, which entered service in the late 1920s.

Despite the Red Army being able to commit large numbers (approximately 10,000 [T-26], 7,500 [BT-5/7], 500 [T-28] and 60 [T-35]) on the battlefield, the German advance seemed at first to have achieved all the objectives expected by the Führer. The Soviets committed thousands of tanks in numerous attempts to cut off German forces, but most were easily repelled, leaving the battlefield strewn with burning hulks and many dead infantrymen.

However, German military planners had underestimated Russian resolve; more soldiers were recruited, also engineers and workers in the armaments and other industries redoubled their efforts to increase production. They had also ignored two other factors; one was the landscape, the other a lack of up-to-date military intelligence:

All versions of the Russian-built T-34 medium tank (here an early type M 1940), proved to be almost impervious to any attack by 3.7cm PaK-armed *Panzerjäger*.





The KV-1 (M 1940), can be regarded as being the first successful heavy tank design. Due to the type having very thick armour, the KV-1 was almost invulnerable to fire from German 3.7cm and 5cm PaK. The tank mounted the same Machanov L-11 gun as the T-34, but this would soon be replaced by the more powerful F-34.

- The terrain formed a natural defensive rampart, and the vastness of European Russia covered by natural obstacles had always been a true challenge for any invader. The Pripyat River, on the way to Moscow, is surrounded by large areas of marsh; a natural barrier to a mechanized army. Many other rivers, most flowing from north to south, formed a barrier to advancing over a wide front. The transport infrastructure in western Russia was underdeveloped to the point of almost non-existence. There were only a few trunk roads and a limited number of railway lines.

- German intelligence had failed to notice that the Soviet Union had, in great secrecy, developed two weapons that can be described as revolutionary.
  The modern-looking T-34 medium tank was designed to be extremely mobile while having excellent armour protection for the crew.
  The heavy KV (Kliment Voroshilov) designed as a break-through tank, had all-around thick armour.

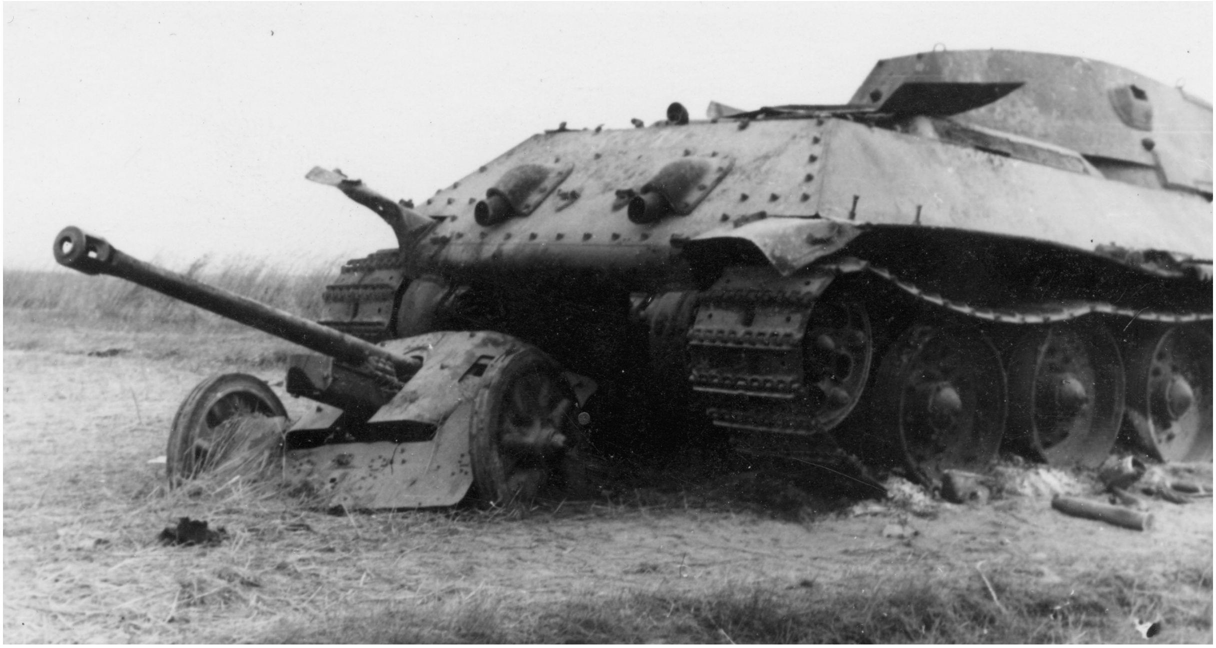
> Both the T-34 and KV-1 mounted the 76.2mm dual-purpose gun which, for a short time, provided Russian tank crews with far superior firepower. (At around the same time the KV-2, mounting a 152mm howitzer, entered service. But only a relatively small number were built).

In July 1941, the Red Army had an estimated 1,850 modern tanks in service – T-34 (1,250), KV-1 (400) and KV-2 (200). By comparison, German forces had a total of 700 PzKpfw III and 440 PzKpfw IV ready for action.

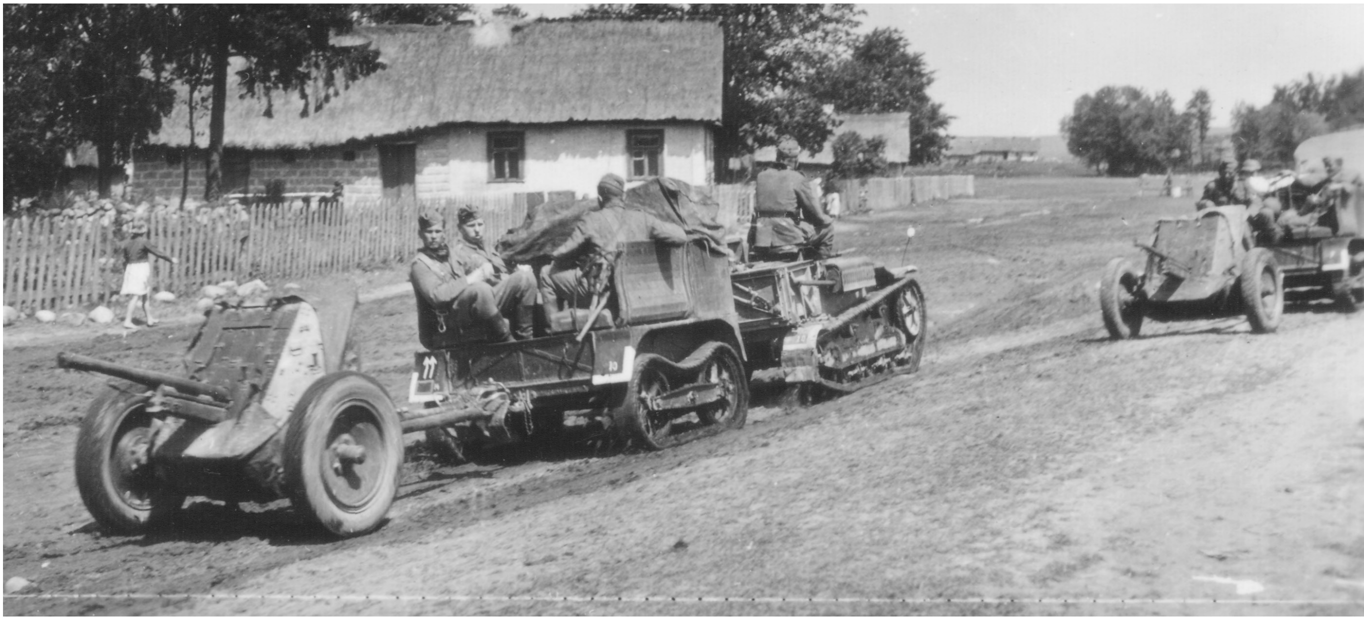
Anti-tank Forces

At the beginning of Operation *Barbarossa*, the German *Panzerjäger* troops were able to contain and defeat any Soviet attack. As noted in Chapter 9, these forces still relied mainly on the 3.7cm PaK; in June 1941 some 14,500 were in service. However, around 1,000 of the new 5cm PaK had been supplied to tank and infantry units; this would continue in small but increasing numbers. Also some 500 Czech-built 4.7cm PaK(t) had been delivered in preparation for the attack.

The new Soviet tanks were encountered for the first time in July 1941. The Commander-in-Chief of 4.Armee, *Generalfeldmarschall* Günther von Kluge, wrote in his army order No.4, dated 1 July 1941:



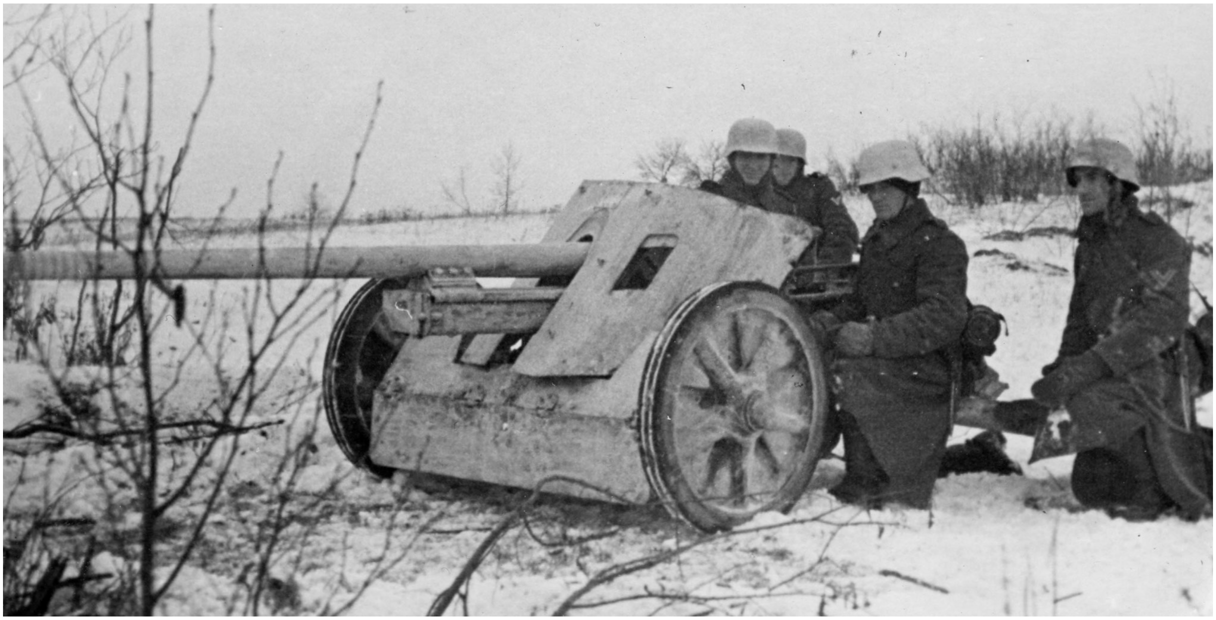
A Red Army T-34 has simply rolled over and crushed this 5cm PaK 38, but the tank was then hit and immobilized. One cannot help but wonder what went through the minds of the *Panzerjäger* as they realized that the fire from their anti-tank gun was ineffective.



During the invasion of Russia large numbers of captured French vehicles were used. Here a Renault UE tows a French-built tracked trailer with a 3.7cm PaK attached. The two white darts symbol on the felt rear of the trailer indicates that all are from the 129.InfDiv.

> 1.) Enemy situation
>
> Desperate attempts by the enemy to break out from positions in the shrinking pocket south and northeast of Zelva they failed. The enemy troops displayed an increasing lack of enthusiasm to fight; their leadership lacked determination
>
> In many cases the enemy is an extraordinarily tough opponent, who on many occasions will fight until he has fired his last round. This dogged resistance increases our own losses. The Russians, mainly from peasant stock, doggedly believe warnings issued by political commissars that they will be shot if taken prisoner. Leaflets distributed by our forces explaining that they will be dealt with fairly has helped on many occasions, and saved casualties on our side.
>
> 6.) Special formations:
>
> It is possible to defeat these Russian heavy tanks: Our 5cm PaK 38 firing the PzGr 40 can be used at ranges up to 400m, also the 4.7cm PaK and 5cm KwK [tank gun] also firing the PzGr 40 at ranges up to 200m. The 8.8cm FlaK can defeat enemy armour at ranges up to 1,000m.

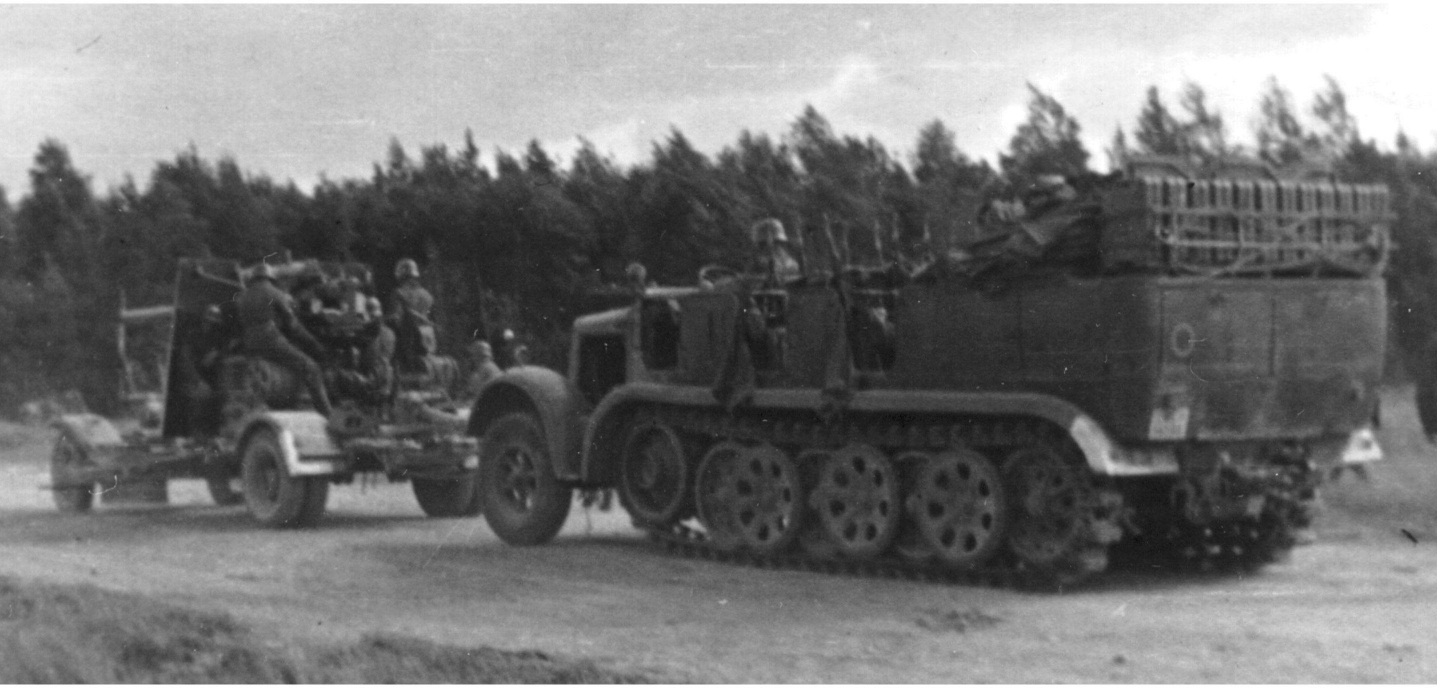
These remarks by von Kluge seem to be of little value to those on the forefront tasked with defending against these new types of Russian tank which appeared on the battlefront with little warning. The inability of the German armaments industry to produce sufficient weapons and also the ineptitude of those responsible for the procurement of equipment was probably kept secret in order not to undermine the morale of front-line forces.

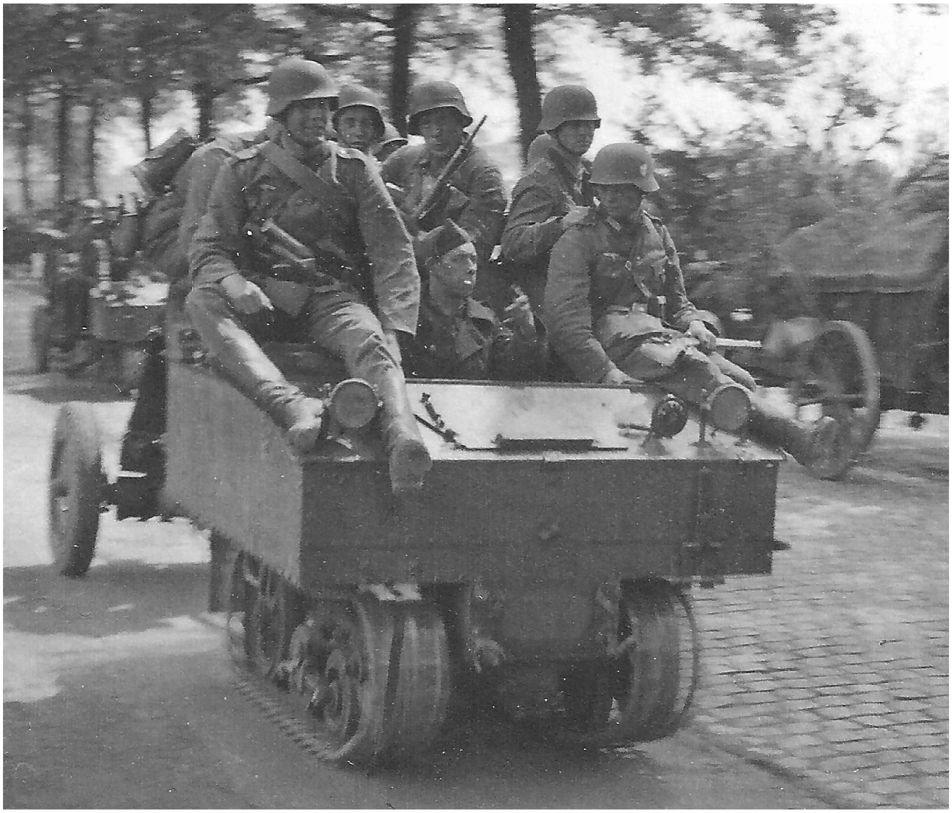


The 137.InfDiv produced a notelet detailing the maximum range at which to open fire against (unspecified) tanks. Although a destructive impact was not always possible, any damage to the running gear or vision devices could immobilize a tank. However, the data in the notelet was gathered from experience gained when fighting French and British tanks. In an addendum, it was noted that the PzGr 40 was not available in sufficient quantities, and even the supply of 7.92mm SmK (H) hard metal rounds was strictly rationed: each soldier in 137.InfDiv was issued with just ten rounds.

Above: With the arrival of the harsh Russian winter, the invading forces began to camouflage their equipment: Here the crew of a 5cm PaK 38 has painted the gun, and even their helmets, with whitewash. In this first winter, many German soldiers could not be issued with suitable warm clothing, and many fell victim to severe frostbite.

Left: Although carefully camouflaged with foliage and positioned at the edge of a forest, the first shot from this 5cm PaK 38 would reveal the location of the gun.





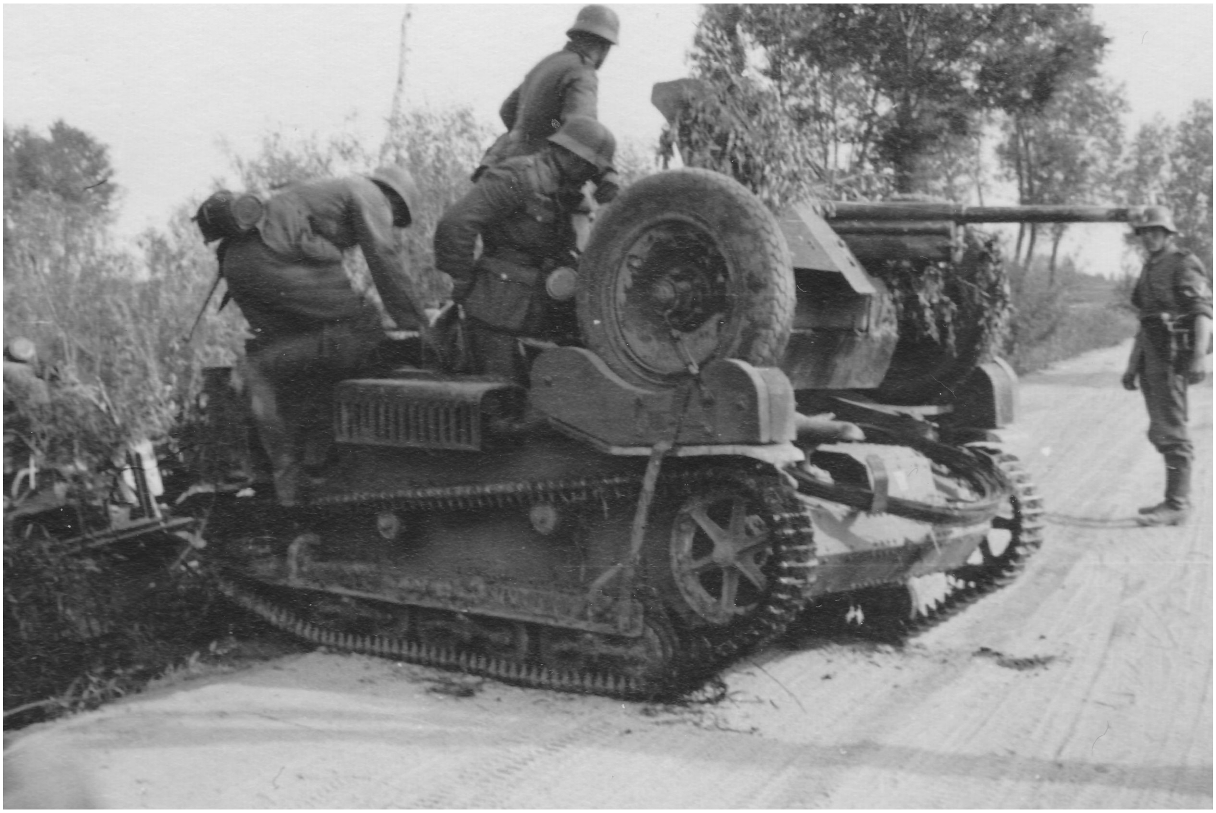
Above: The German advance during the first weeks of Barbarossa was conducted along the (very few) major highways. But these roads were actively defended by Russian forces, including armour. An 8.8cm FlaK 18 is being carefully pushed forward by its tractor, after a number of enemy tanks had been sighted.

Right: Due to the constant shortage of suitable tractors German forces had to use whatever was available. A British-built Vickers Utility tractor captured from the Belgian army is being used to tow a 3.7cm PaK.

Weapon	Range
leFh 18, (PzKopf-Granate, [rot])	1,800 to 1,900m
5cm PaK 38	600 to 700m
7.5cm le IG 18 (PzGr)	400 to 600m
3.7cm PaK (PzGr)	200m
3.7cm PaK (PzGr 40)	400m
2.8cm s PzB 41	200m
PzB 38 and 39	200m
MG and rifle (SmK (H))	150m

A situation report, dated 5 August 1941, from 137.InfDiv during their advance to Smolensk, illustrates the type of problem experienced by *Panzerjäger* fighting the T-34.

> 17:40hrs
> Situation: The army has demanded that we take the bridge at Boganov intact. Our unit is supported by two heavy and two light batteries from 10./InfRgt 449, 3./PzJgAbt 137, and on our right flank the 3./Pionier (mot).

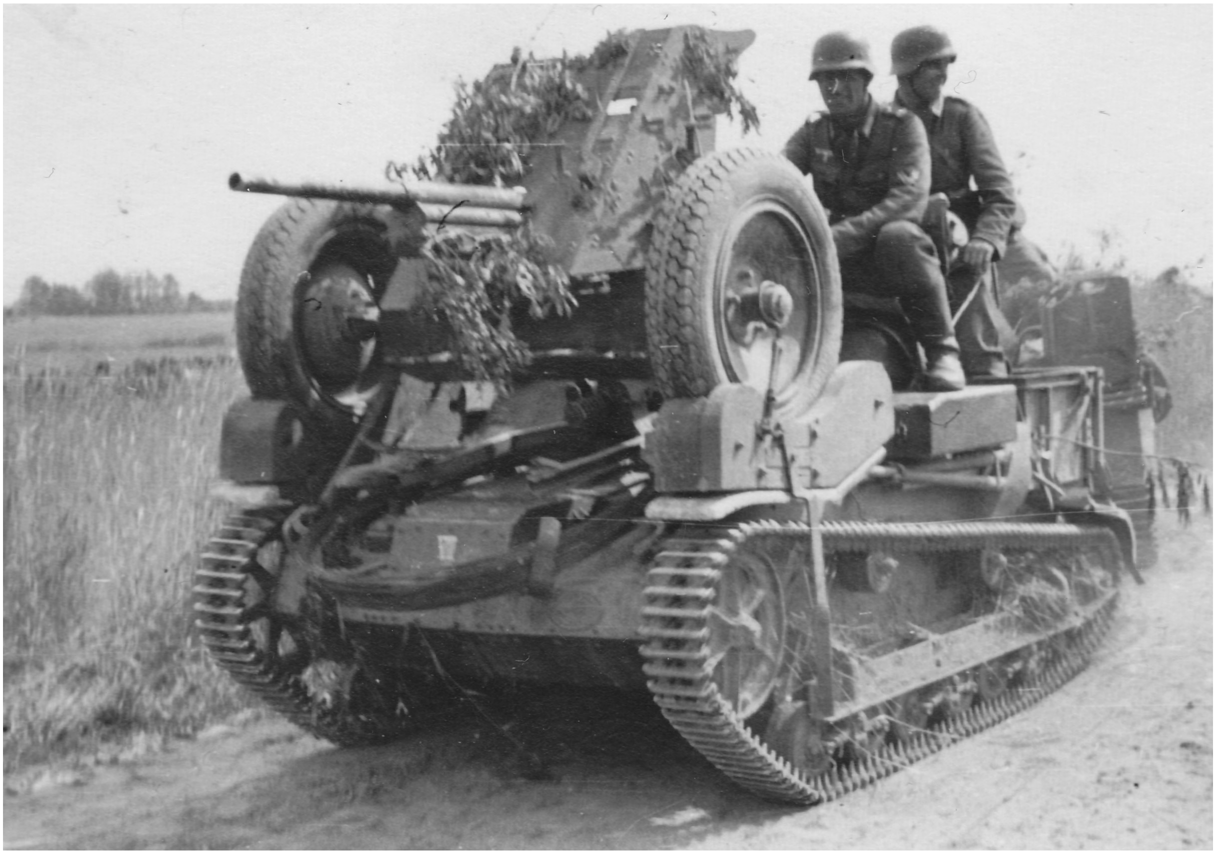


A Renault UE has been adapted to become a self-propelled gun. The 3.7cm PaK is supported on two large wooden chocks and strapped down to prevent it rolling off.

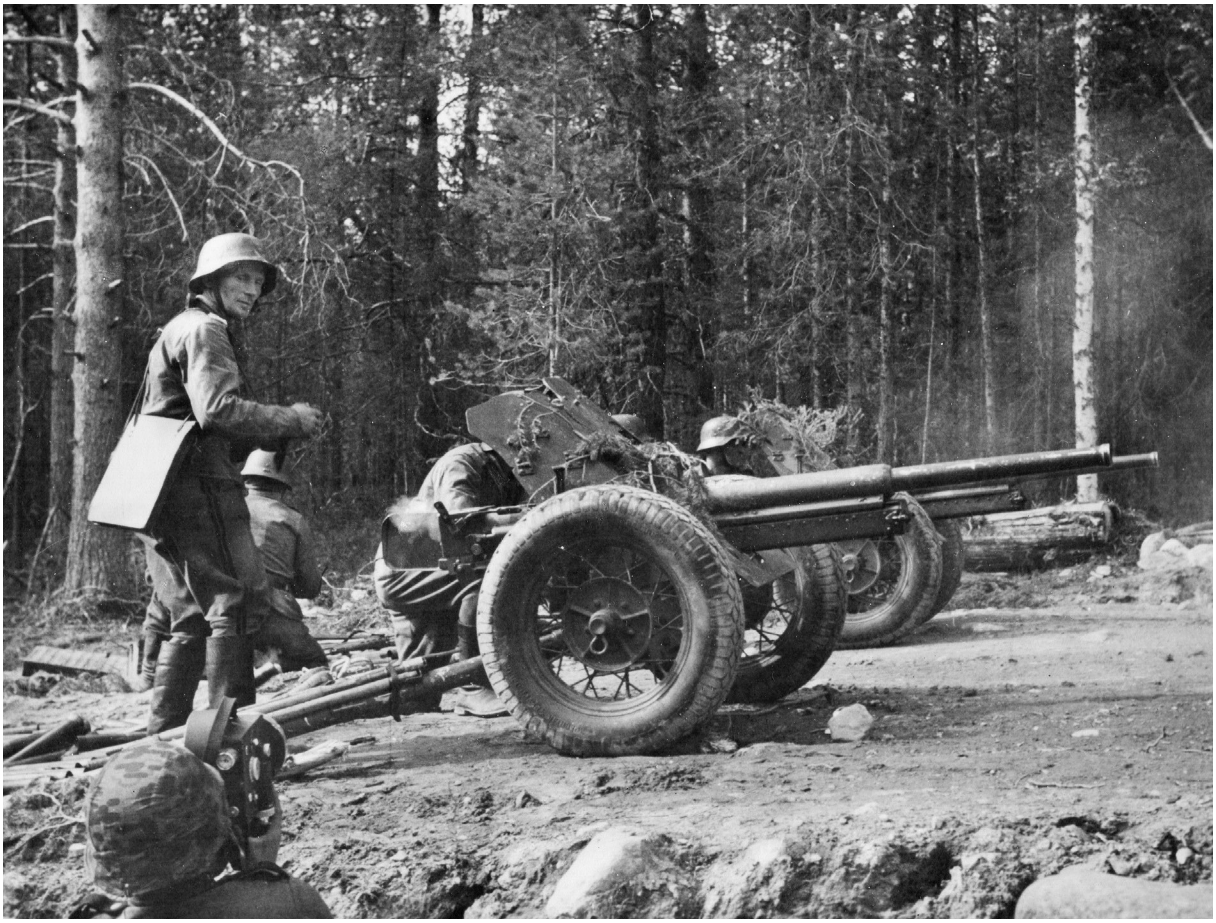
> 18:45hrs
> InfRgt 448 formed defensive positions which the enemy continues to attack from the front and the south. One battalion from InfRgt 447 is in position at Utechovo and Barssuck. *Leutnant* Husenauer of 6./447 reported: Enemy 26-ton tank [T-34] followed by 16 infantry approached from the west and rolled over one of our PaK positions, crushing the gun; the crew had already escaped to safety. We can hear loud engine noises in the distance, and are expecting more tanks to follow. Our commander orders two PaK and one 10.5cm gun to assist.
> 19:15hrs
> 3./PzJgAbt 137 hold their own position, until rifle and PaK ammunition stocks become critical.

A telex message sent on 7 August noted:

> 14.30hrs
> Attack by super heavy tanks [KV-1], we urgently request immediate support by heavy FlaK.



The same Renault UE being driven to the frontline; the driver is just visible in his cramped compartment. A coil of heavy wire is carried on the front glacis plate and the vehicle would be towing a small tracked trailer to carry ammunition.



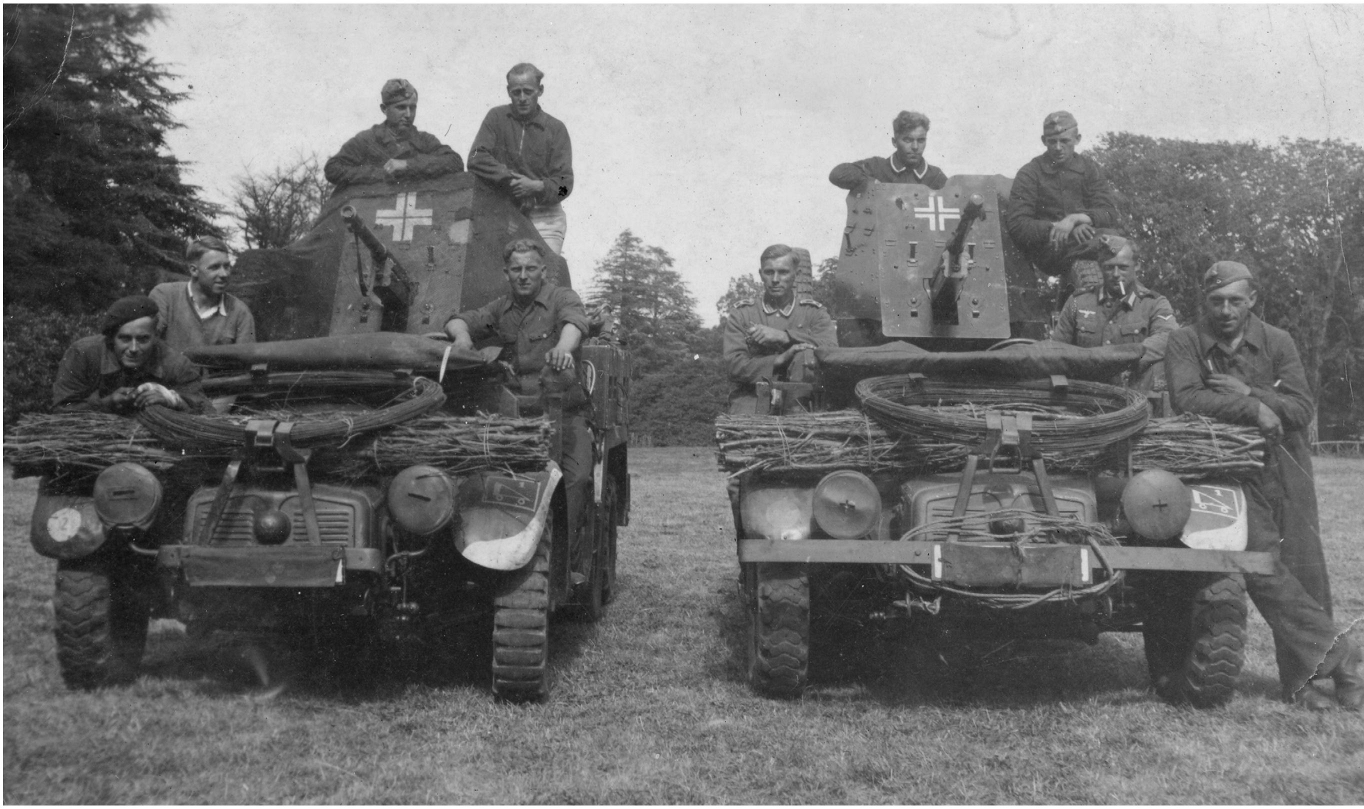
Russian-built guns were somewhat superior to German types, and since they were being captured in large numbers many unofficially entered service with German units. A short time later collection of these weapons was taken seriously. This 4.5cm PaK 184(r) had better performance than a 3.7cm PaK firing the standard armour-piercing round.

> 14:40hrs
> Light anti-tank gun destroyed by a direct hit.
> 15:35hrs
> InfRgt 448: Near Krasnaya Slobida, the tracks on a 45-ton tank [KV-1] have been destroyed and although immobilized it continues firing in all directions. A 4.7cm PaK has been ordered to silence the tank.

On 21 August, the commander issued his daily order:

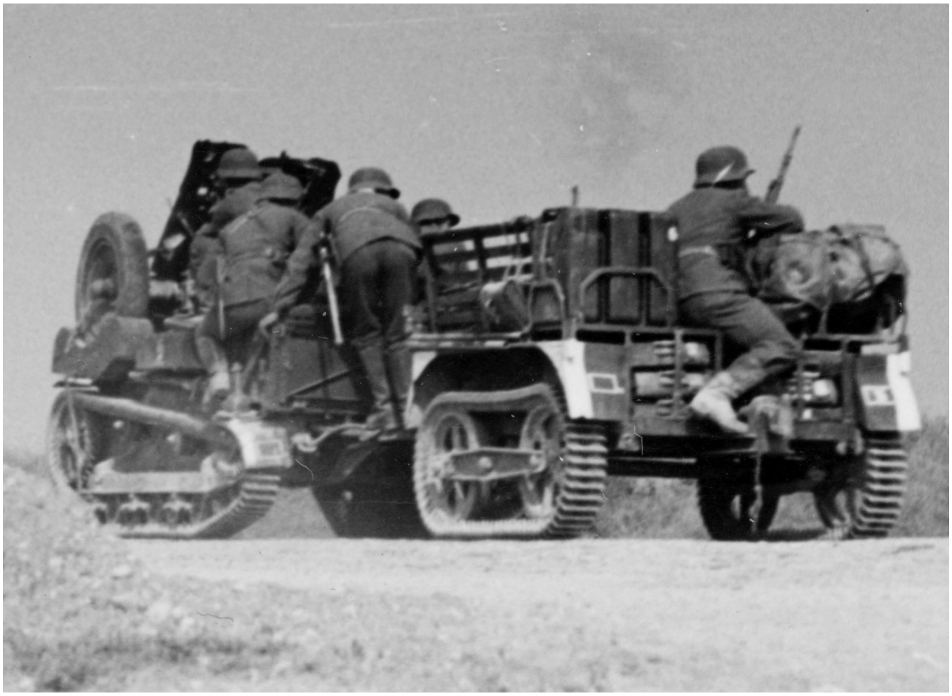
> PzJgAbt 137 with the divisional *Panzerjäger*, reinforced by two 8.8cm FlaK and two 2cm FlaK from FlaKAbt 245, and 2./StuGAbt 203 [*Sturmgeschütz*] will guard the regimental sectors of InfRgt 449 and 447.

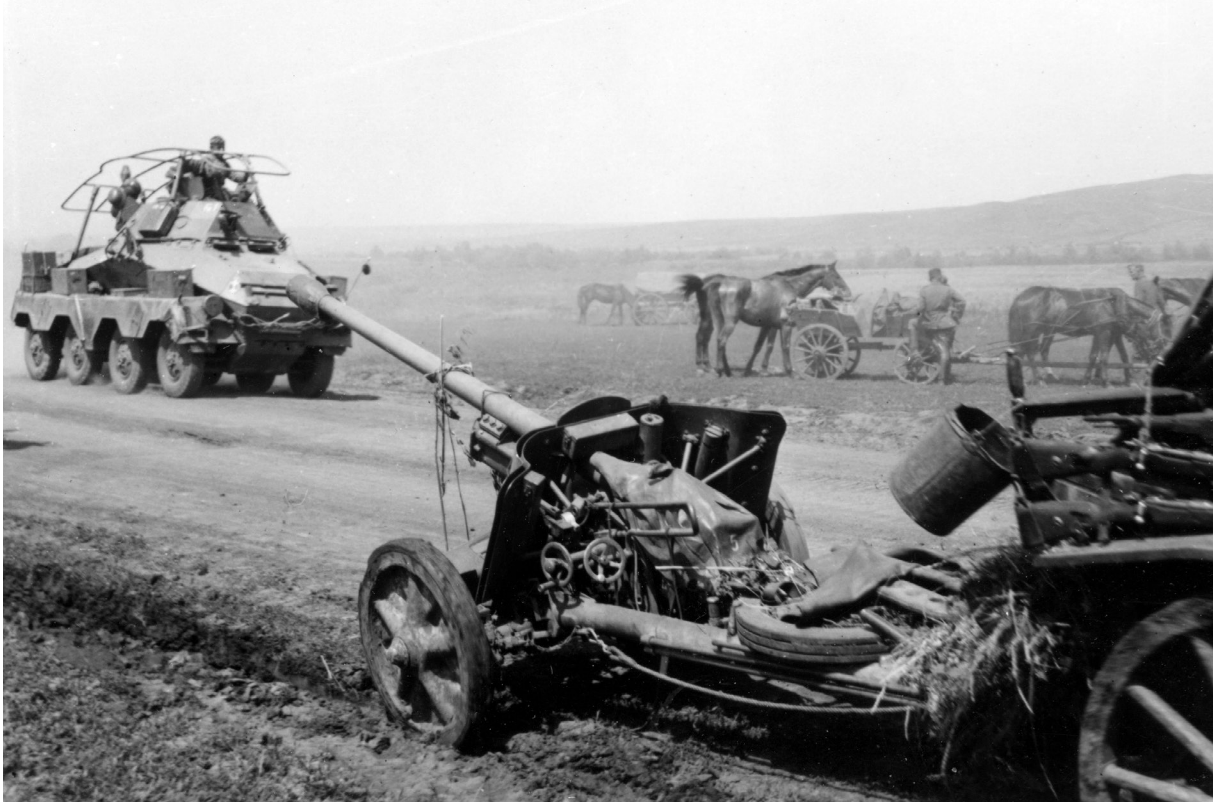
The 3.7cm PaK, which equipped the vast majority of *Panzerjäger* units, could only fight these new Soviet tanks at very close range. To effectively defeat the

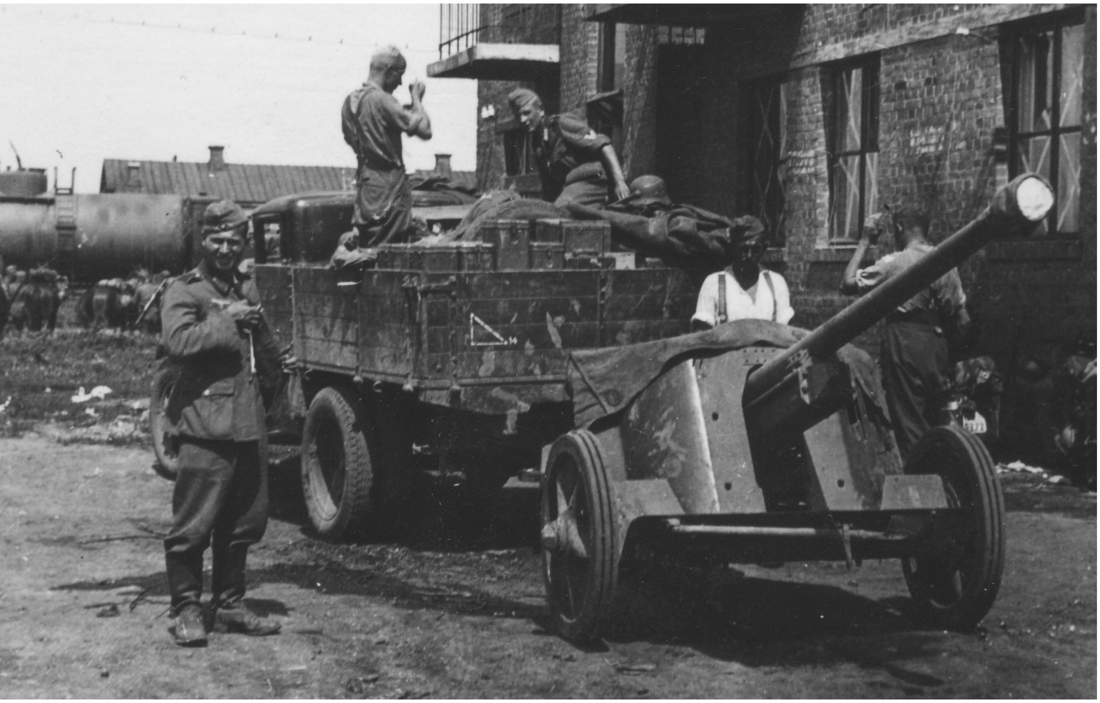


Above: Two *Protzkraftwagen* have the 3.7cm PaK mounted on the cargo bed. The modification was carried in the field and following instructions from front-line troops who were aware of the tactical needs at the battlefront.

Right: A Renault UE with 3.7cm PaK mounted on the front and attached to a tracked trailer comes under fire from hidden Soviet infantry.

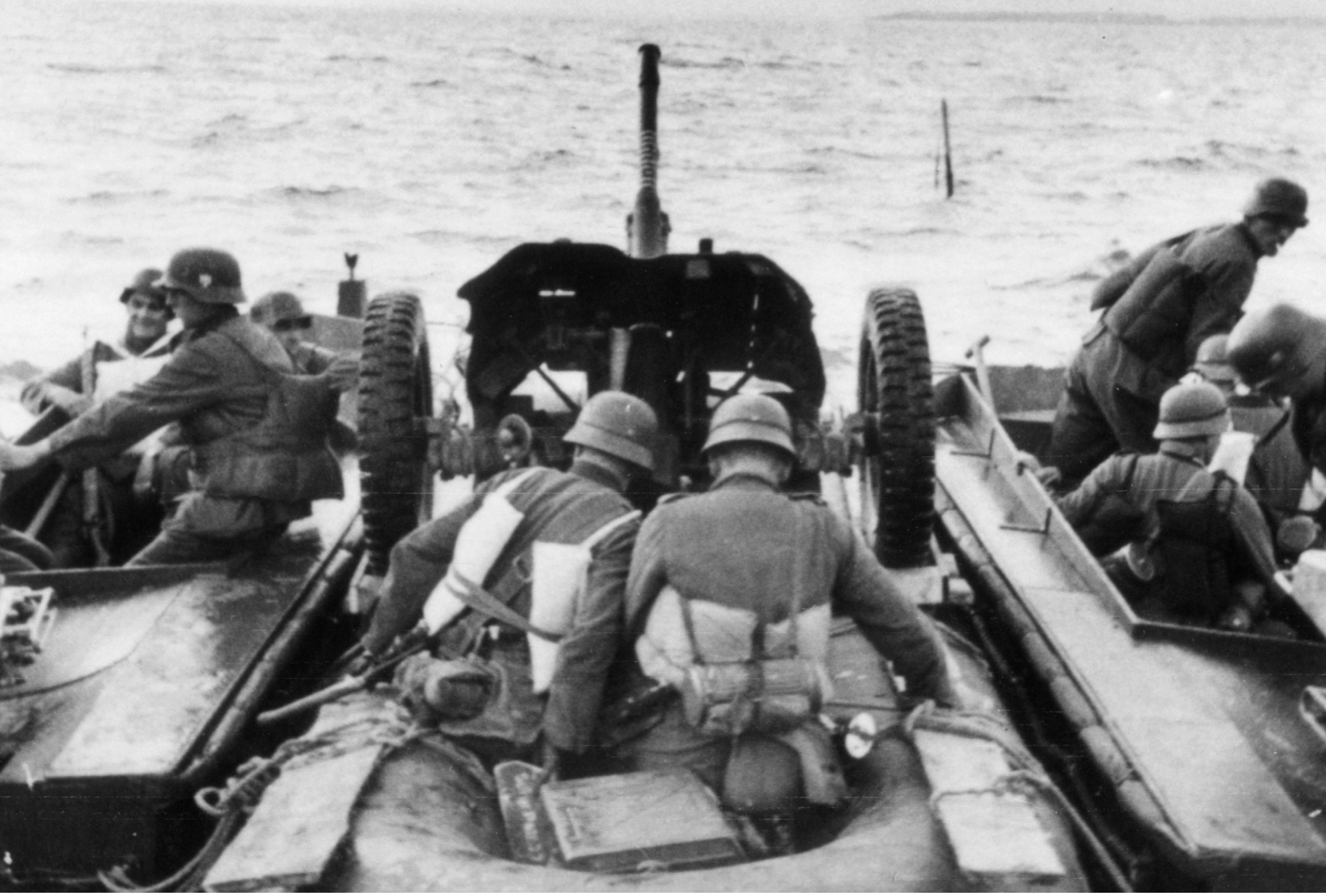






Above: When no tractor vehicles were available even the heavier 5cm PaK 38 had to be towed by horses. In the background, a *schwerer Panzerfunkwagen* (SdKfz 263) from an armoured signals battalion passes the column.

Left: A 5cm PaK 38 has been hitched to a captured GAZ AA light truck which carries a German tactical sign for 14.Kp (regimental anti-tank company).



A rubber dinghy carrying a 3.7cm PaK is supported between two *Sturmboote* (assault boats), during the assault by German forces on Ösel (Saaremaa), the largest island in Estonia. Note the gun barrel has been raised to maximum elevation, possibly to prevent it being damaged by seawater.

T-34 and KV tanks, German units were forced to deploy all available weapons, including 4.7cm PaK commandeered from the Czech army or those captured from the French.

The 268.InfDiv was deployed in the central sector of the Eastern Front and headed directly for Moscow.

A note from their war diary made during the advance to Vyazma records:

> 2 August 1941
> As expected, the enemy has launched a major assault. This time he deployed numerous tanks to push his infantry forward. The assault started in the early hours of the morning. Luckily our units had been alerted and were ready by 02.30hrs. Our troops passed this baptism of fire in an outstanding manner as enemy tanks rolled over their positions. Although our 3.7cm PaK proved to be absolutely useless against the enemy heavy tanks – which ruthlessly crushed some guns and collapsed our trenches by driving back and forth – all weapons concentrated their fire on the tanks. When the first tanks caught fire, our troops, spurred on by the

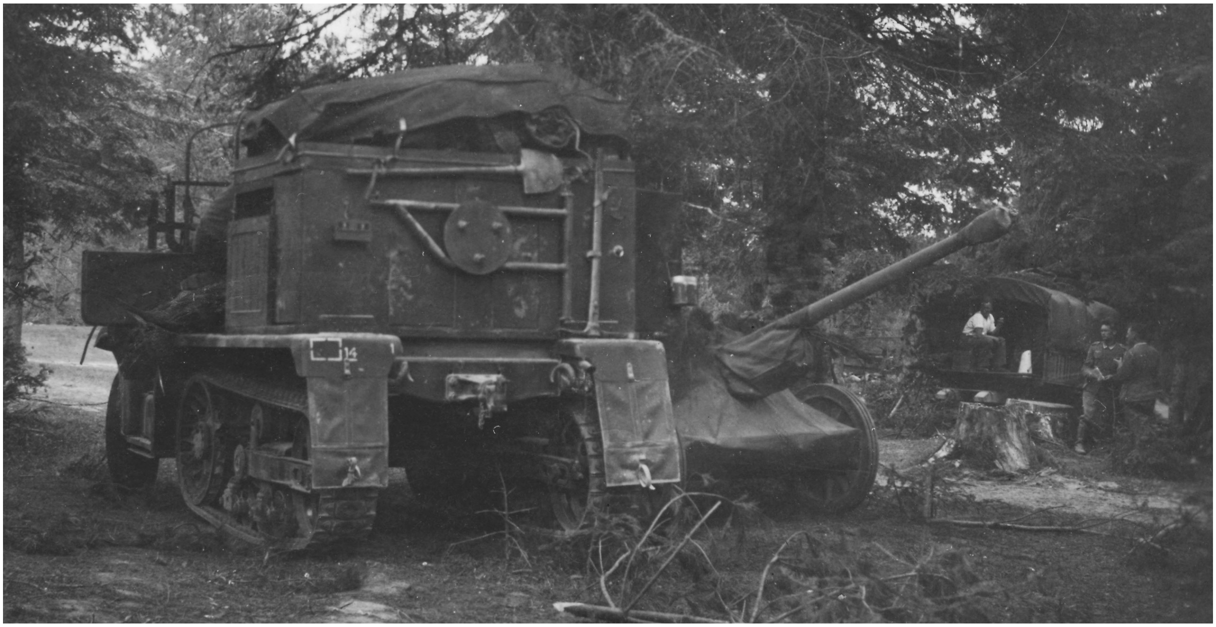
> success, fought with even more enthusiasm. The attack was halted by fire from our infantry directly in front of positions held by I./InfRgt 499.
>
> Although we had again achieved a satisfactory victory, it was clouded by the destruction of heavy weapons: two PaK from 14.Kp were destroyed by tank fire, which also wounded their crews. The other two PaK ran short of ammunition.
>
> It was vital to bring replacement PaK and ammunition forward. The regiment requested for one 4.7cm PaK of 3./PzJgAbt 268 to be transferred to the sector held by 1.Battalion. The enemy remained quiet, allowing us to prepare for his next assault.

This report shows the great problems German units were confronted with. If 5cm PaK were not available, then the 4.7cm PaK was often the only suitable weapon to defeat Russian armour: just one gun could relieve an emergency situation.

During the first months of Operation *Barbaraossa*, 252.InfDiv compiled the following observations for fighting the KV-1 tank.

On 22 September 1941, the 78.InfDiv submitted their after-action report on the fighting in the Jelnya salient near Tichova:

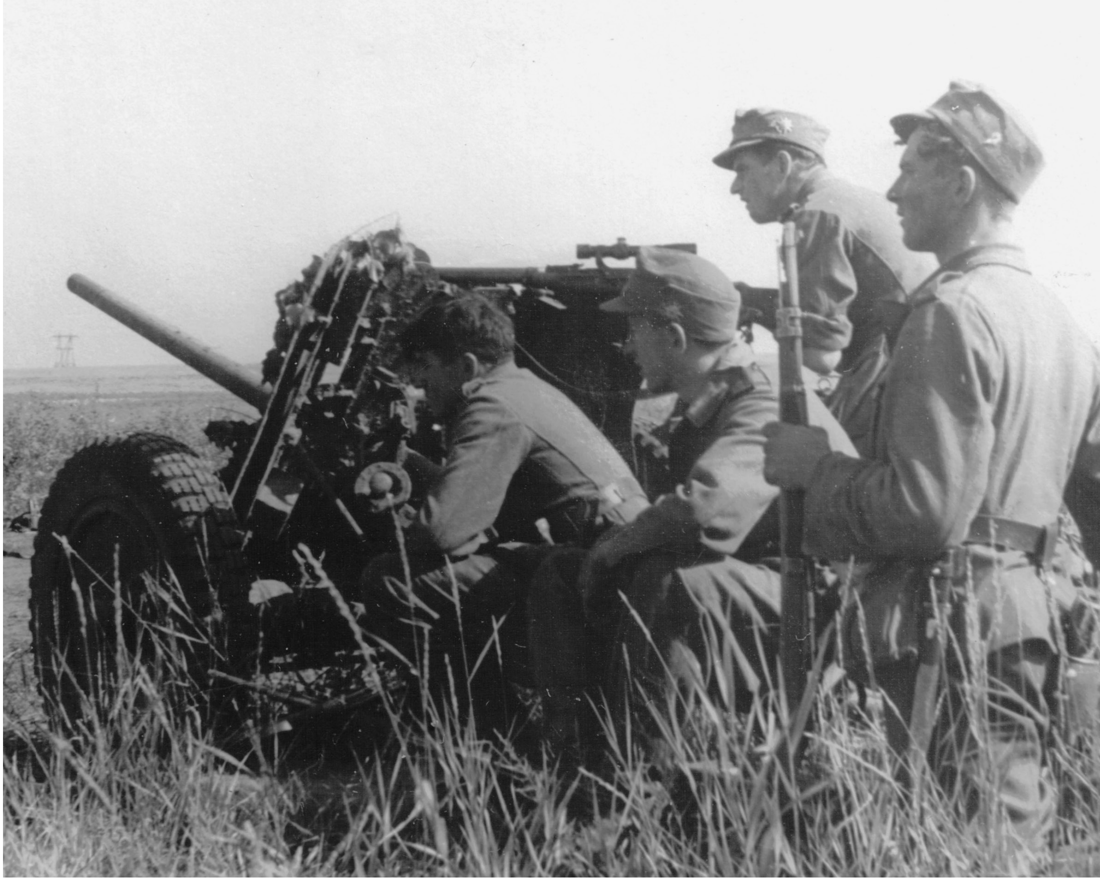
> On 5 September, PzJgAbt 178 deployed its 1.Kp in the right part of the divisional sector in order to avoid an enemy breakthrough. The remaining elements of the battalion were deployed near Berniki to guard the right flank of the division and the left flank of neighbouring units.

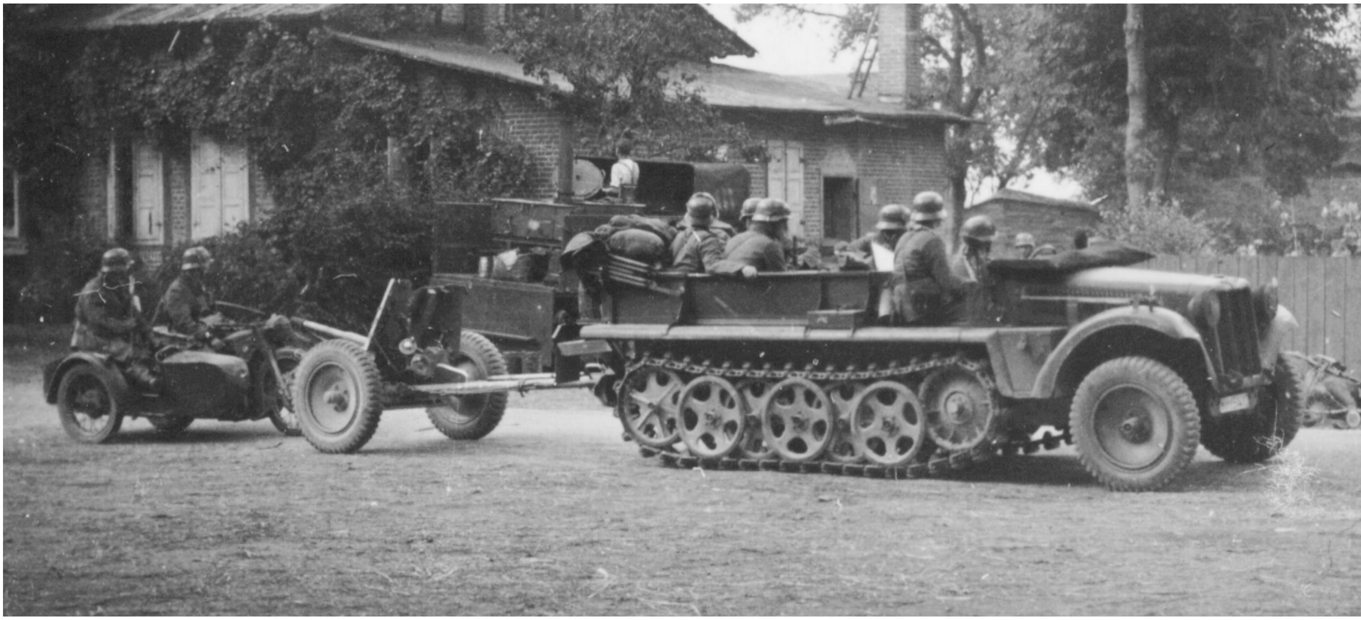


This French-built Unic P 107 half-track vehicle is being used as a tractor for a 5cm PaK 38 from 14.Kp (regimental anti-tank company). Although the vehicles performed better than expected, there was a serious problem with the supply of spare parts.

Right: It is difficult to identify this anti-tank gun manned by *Gebirgsjäger* (mountain troops), but shape of the barrel suggests that it is a 4.2 cm PaK 41. Note the soldier in the background; he is armed with a 98k fitted with a telescopic sight as a sniper rifle.

Below: In 1941, the SdKfz 10 was possibly the best light gun tractor available. But although it was generally reliable, low ground clearance and the front axle was being susceptible to damage led to the type being heavily criticized. As noted in many official documents, the number built was never sufficient to meet military needs.





> During the morning of 6 September fierce fighting developed in front of the forward starting point Petrova. At midday enemy tanks moved up and the defending company had to retreat. Enemy aircraft ruled the sky. After a quiet night, at dawn on 7 September the enemy regrouped his forces and launched reconnaissance raids which were repulsed. He repeated the attacks in strength using up to two battalions supported by tanks. The Russians made eight attempts to overrun our front-line positions, which – although not fully established – held. Enemy long-range artillery continued shelling our positions.
>
> On 11 September, the enemy attacked and was for the first time supported by his new rapid-firing rocket weapon [Katyusha BM-13*]. During two of his attacks he deployed ten to 15 tanks.
>
> The next day the enemy continued his reconnaissance raids and launched attacks against the centre of the division and also the right-hand side positions. Each of his battalion-size attacks were supported by up to six tanks. Again all attacks were repulsed. We observed several enemy assembly areas which were attacked and obliterated.
>
> Four 52-ton [T-34] tanks were attacked by medium PaK [5cm PaK 38] at ranges of 15m. Despite many clear hits the tanks remained undefeated. However, after the commander's hatch on one tank was blown off, all turned and retreated.

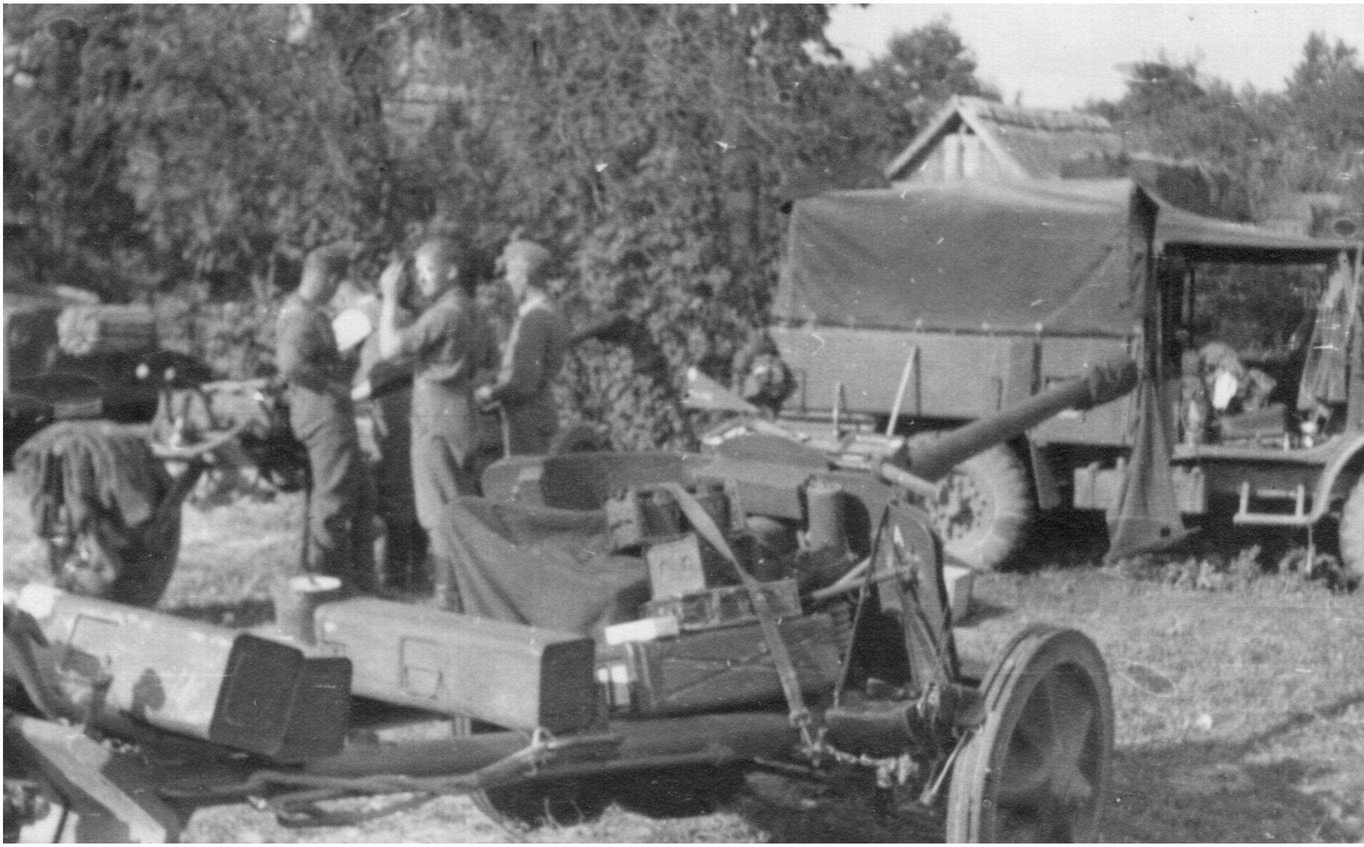
[*The Katyusha multiple-rocket launcher was called *Stalinorgel* (Stalin's Organ) by German troops.]

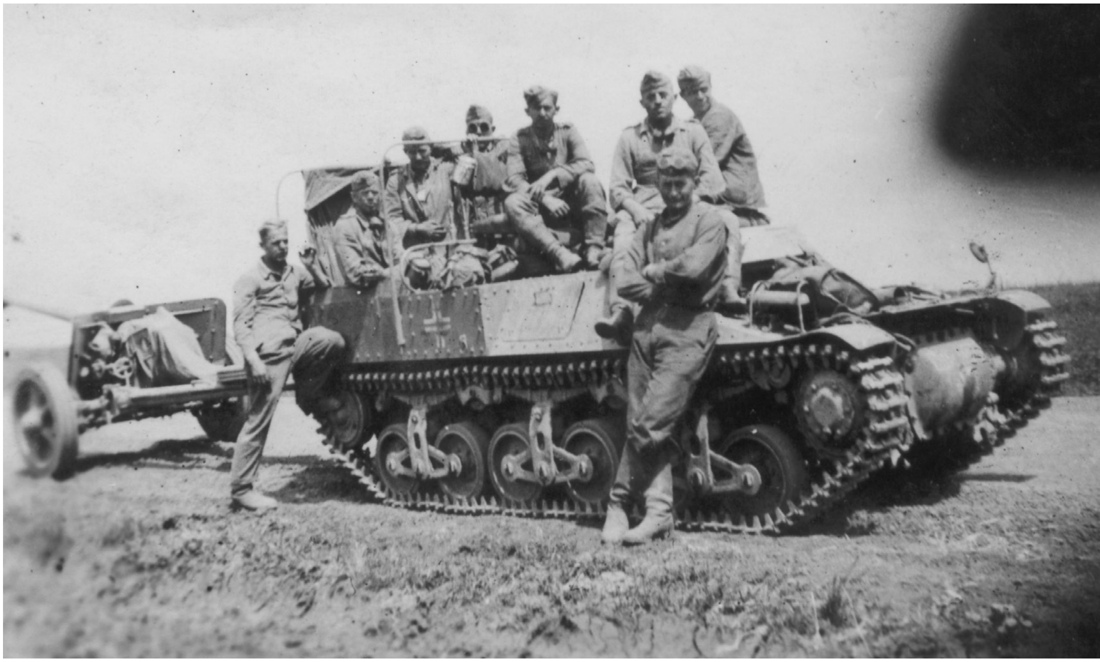
While attacks by T-26 or BT light tanks could, in most instances, be easily repelled, German anti-tank forces found the KV-1 to be almost unstoppable.

The German formations, *Panzerjäger* and all other units, had to employ every type of weapon available to fight enemy tanks. Rifle and machine-gun fire could effectively blind the crew by shattering the vision devices. The anti-tank rifle was barely powerful enough to damage vital parts, including the tracks and running gear. But the anti-tank gun was the weapon to properly immobilize or destroy an enemy tank.

If time allowed, engineer troops would lay patterns of magnetic mines some distance away from the front line to halt the approach by enemy armour; even a KV-1 could be effectively immobilized.

In general, a soldier in the Red Army was poorly trained and lacked combat experience, although as an individual he was often described as being a fearless and courageous fighter led by ineffectual (inexperienced) officers and commanders. It would take precious time for the Russians to evaluate then cope with *Auftragstaktik* (mission-type tactics) employed by German forces. For tank crews, the lack of radio equipment, poor and insufficient vision devices made life on the battlefield difficult and often dangerous.





Above: A 5cm PaK 38 with ammunition boxes stacked on the trails. In the background is a Bedford 15cwt (probably captured in France) which has been issued to this *Panzerjäger* unit as a gun tractor.

Right: The Chenilette Lorraine 37 L was also used to tow an anti-tank gun, including the 5cm PaK 38. This most versatile and popular vehicle was however preferably used as a self-propelled gun mounting the 7.5cm PaK or other artillery piece.

Portable Anti-tank Weapons

New tactics were developed and introduced for anti-tank weapons such as mines and explosive charges to allow the front-line soldier to attack – and immobilize – even the heaviest tank. However courage, not the equipment, would be the key to success.

Realizing that an anti-tank detachment in an infantry regiment could no longer be relied on to halt an enemy infantry attack supported by tanks, it became necessary to train the troops for close combat against a tank. An order was issued to train soldiers in preparation for the formation of *Panzervernichtungs-Trupps* (tank PzVernTrp – tank destruction teams).

On 22 September 1941, the Commander-in-Chief of the army published a summary of first-hand combat reports made during the fighting on the O*stfront*:

> The vast openness of Russia and its rough terrain forced the Red Army to establish their main points of resistance adjacent to roads, built-up areas, rivers and streams and also along the edges of woodland. Here he will wait for the attacker, ready to ambush him with well-aimed gunfire.
>
> Our troops will have to be prepared for this type of attack. The troops preparing to surround the enemy must be reinforced for their task. All available weapons (grenade launchers, anti-tank guns and rifles) must be carried; all hindrances (vehicles, etc.) must be left behind. In general it is appropriate to delegate special tasks to supporting pioneers.

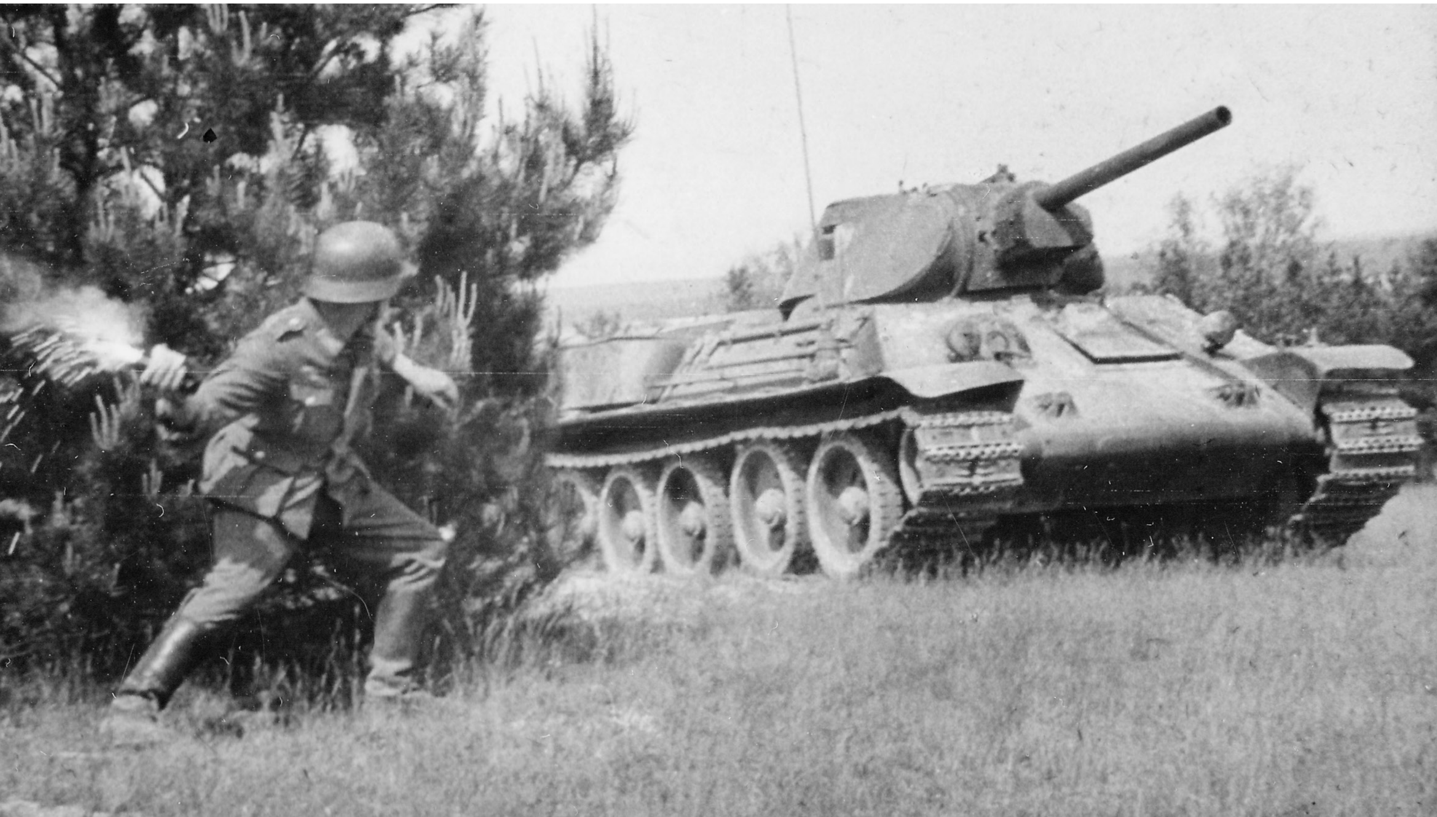
With regard to anti-tank defence the report continues:

> For anti-tank defence using the weapons of the *Infanterie-Divisionen* and *Infanterie-Divisionen* (mot), the following experiences were noted:
>
> 1.) Infantry supported by artillery and reinforced by PaK can repel any tank attack. Each man must be certain that he can do the job with his weaponry.
> 2.) Every weapon, not only anti-tank rifles, PaK and FlaK, tanks and *Sturmgeschütz* have to be deployed according to the situation on the battlefield:
>
> *Maschinengewehr* [MG – machine gun] and rifles with SmK H ammunition against weaker armoured parts (side and rear of the hull; the gap between turret and hull; tracks and running gear).
> MG and rifles with s S ammunition against vision devices and escape hatches.
> Hand grenades can be thrown into an open hatch.
> *Geballte Ladungen* (concentrated charges) can be used to destroy the tracks.
> Flares can be used against all vision devices and gun ports.

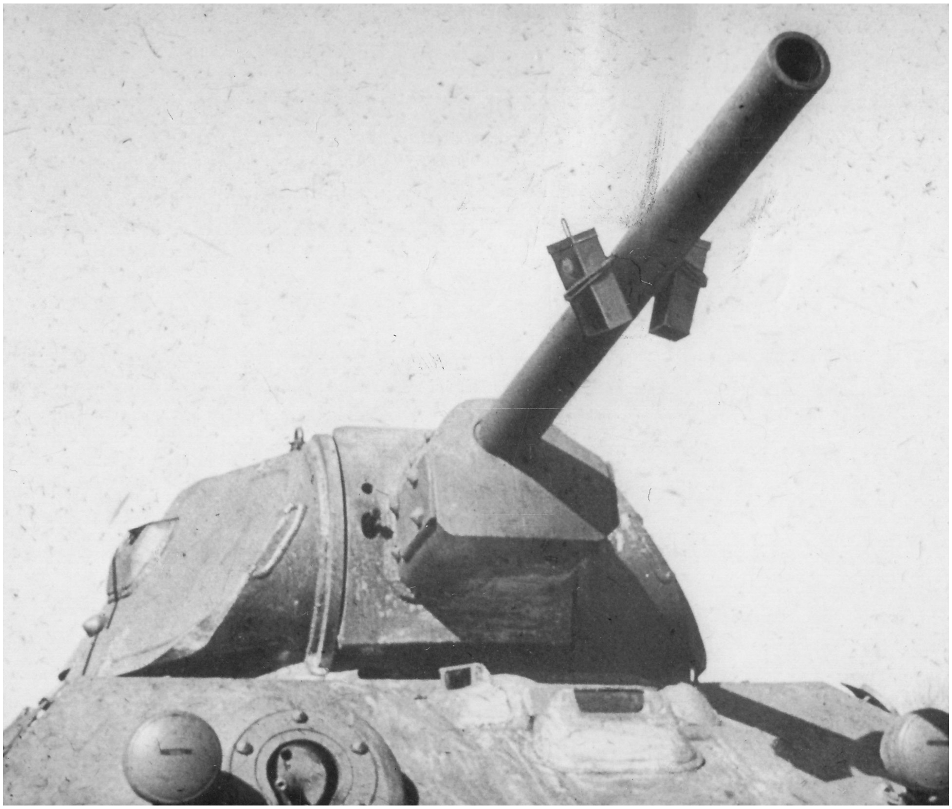
> Flamethrowers will be used as above, but also on escape hatches and against escorting infantry.
> Grenade launchers, MG and small-arms fire must be directed at escorting infantry to separate from the tanks.
>
> It is imperative that all types of available weaponry are used, and all troops are under strict orders not to open fire too soon as this will jeopardize any chance of success.

In January 1942, 2.Armee published a leaflet which, for the first time, indicated how the PzVernTrp would be deployed:

1.) *Panzervernichtungs-Trupps*
  Strength:
  Commander with messenger
  Security team of three men with MG and MP
  Nebeltrupp with smoke weapons or incendiary bottles
  Demolition troop of six men with two to three *geballte Ladung*
  One 10-litre jerry can, T-mines and hand grenades
2.) Combat
  Approaching tanks will be attacked with smoke agent to blind the driver and to enforce a decrease of speed. Then a *geballte Ladung* of at least 6kg (two 3kg

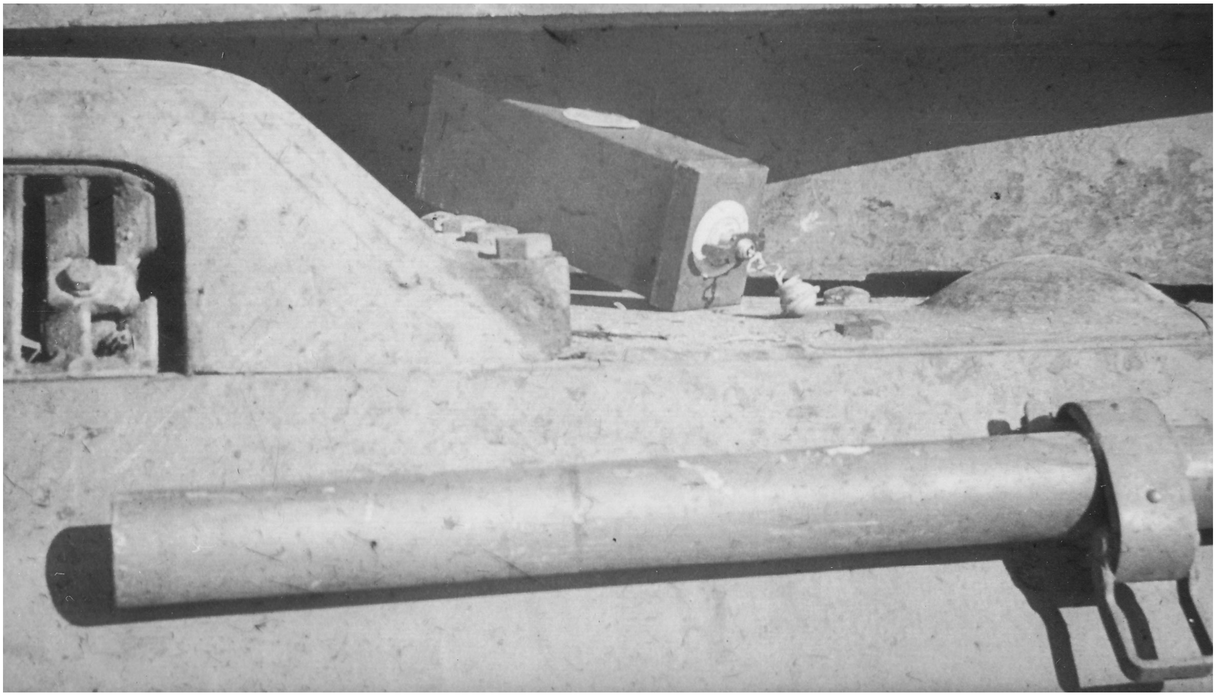


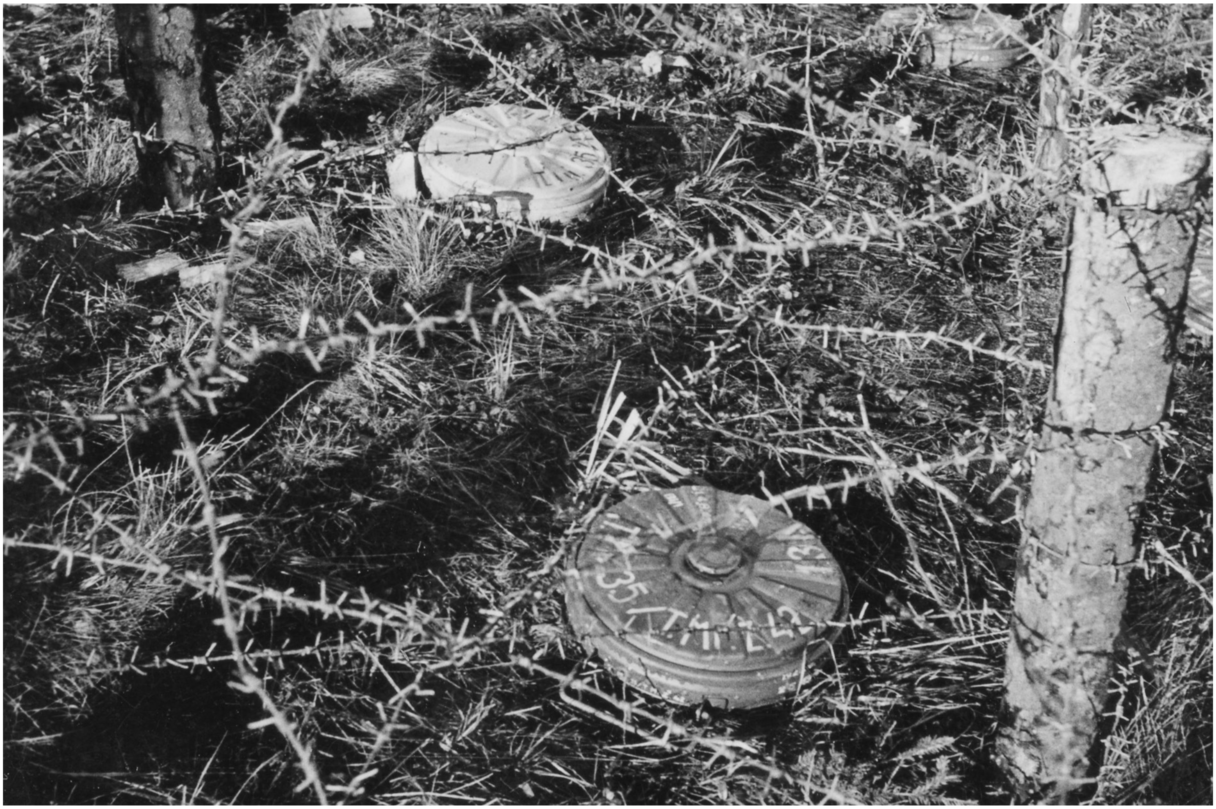
Throwing an improvised anti-tank device, such as a Molotov-Cocktail, at an advancing T-34 required a lot of courage, but if it exploded on the engine deck it could ignite residual fuel and oil.



Left: Two 3kg *geballte Ladungen* have been thrown on to the gun barrel of a T-34 during a demonstration. Any attempt to do so required the tank to be immobile, or the crew to be otherwise occupied.

Below: If a 3kg *geballte Ladung* could be carefully placed under the turret overhang the resulting explosion would damage the turret ring or even blow the turret off.





On some occasions T-Minen 35 would be laid in the open rather than buried. The barbed wire obstacle was placed around the mines to prevent easy removal.

> charges), or mines will be placed under the tracks to blow them off the tank. It is important to place mines centrally under the track to ensure total destruction. Incendiary bottles will be lit and thrown against front and side plates. The burning fuel can set the tank alight.
>
> If the tank has passed through the line of the PzVernTrp, a 1-litre can of flammable liquid combined with a hand grenade or a 3kg *geballte Ladung* can be placed behind the turret.
>
> A *geballte Ladung* assembled from hand grenades can damage or destroy weaker armoured components.
>
> 3.) The PzVernTrp will conceal themselves in the terrain to avoid being fired on by tank weapons.
>
> 4.) All infantry, rifle and tank destroyer units will immediately establish *Panzervernichtungs-Trupps* according to these requirements.

On 17 November 1941, WaPrüf 6 began planning a visit by representatives of the German armaments industry, accompanied by the *Panzer-Kommission* to the eastern front. The meeting was also attended by *Generaloberst* Heinz Guderian.

Special Weapons

The *schwere Schartenbrecher* (heavy bunker buster) had been designed and developed before the outbreak of war. The gun and tractor combination had first been used during the invasion of Poland and then again in France. It was called back into front-line service for the assault on the bunkers which formed the Stalin Line, but the arrival of Red Army heavy tanks on the battlefront heralded a new and very important role.

8.8cm *BunkerFlak*

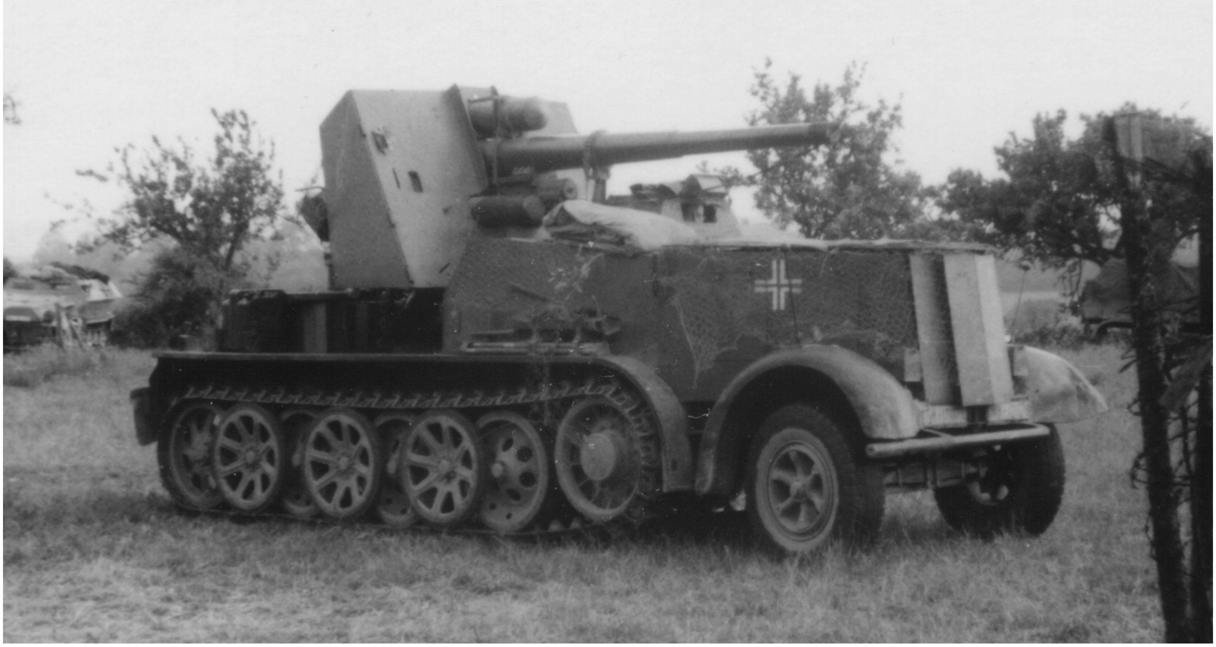
The partly-armoured 8.8cm FlaK 18, which had been deployed in two versions during the French campaign, had presented military planners with a dilemma. The 8.8cm gun proved capable of defeating any enemy tank, even from long range. However, the partly armoured SdKfz 7 towing vehicle was vulnerable to fire from tank or anti-tank guns. More importantly, the combination lacked manoeuvrability, and heavy mud caused the tractor unit to fail. After the invasion of France, a decision was taken to disband the three PzJgAbt equipped with these guns.

A second type with the 8.8cm FlaK gun mounted on the rear of a partly armoured SdKfz 8 was a much better weapon. Although only fitted with light armour, the half-track vehicle could be driven over almost any terrain in close support of the combat troops and be almost instantly ready for action.

In June 1941, 1/(s) PzJgAbt 8 (attached to PzJgAbt 643) was equipped with six of the type at the beginning of their advance into Russia.

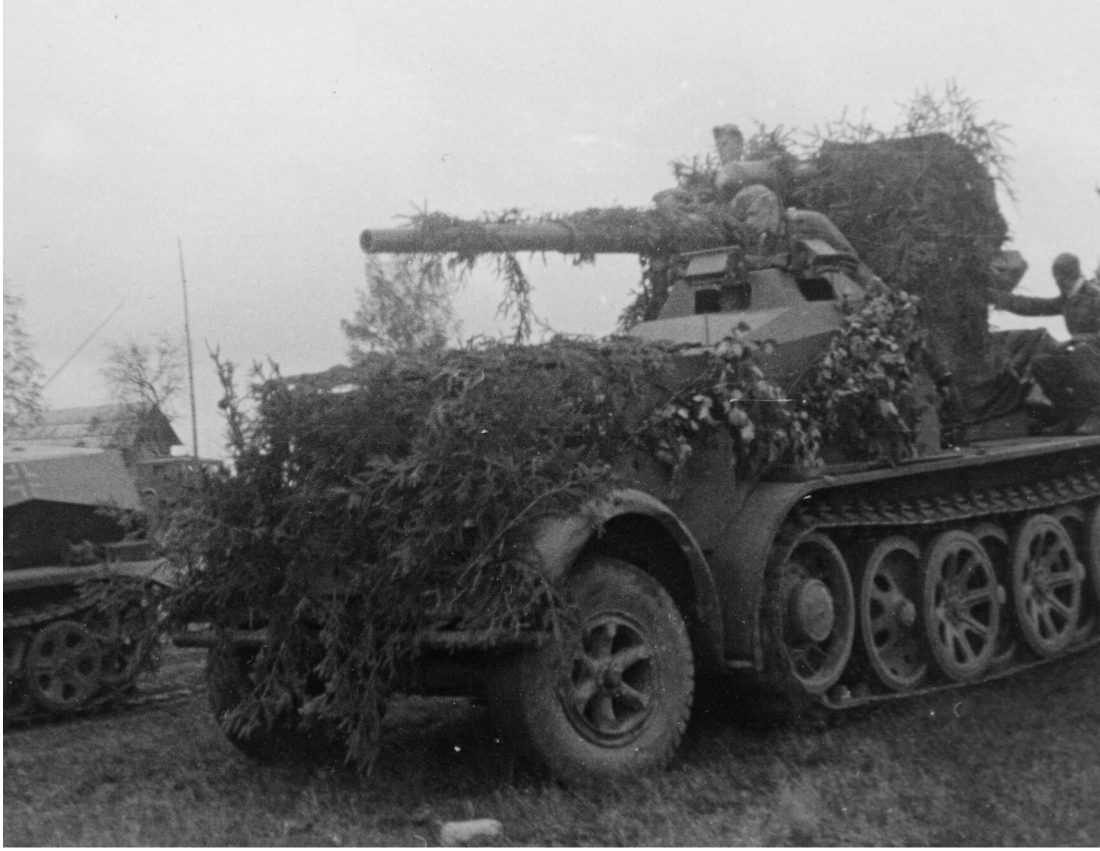
On 22 July 1941, the unit delivered an after-action report which tells of the fierce fighting:

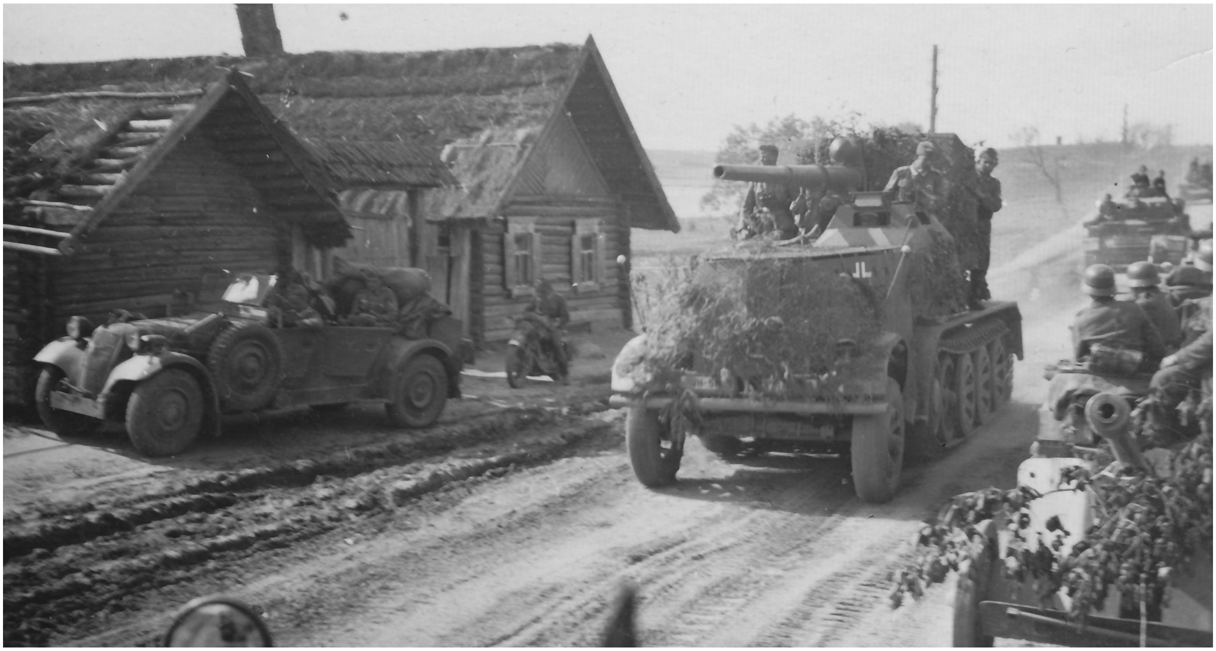
> 6 and 7 July 1941, Platoon Kropka
>
> In the early afternoon of 6 July, I received orders from my company commander to guard I./Schützenregiment 7 against tank attack. I moved my three guns [8.8cm FlaK 18 on SdKfz 8] into position some 2.1km south of Height 145 near Lichatski. In the evening I observed a Russian tank battalion moving from the southeast, but keeping well out of firing range. At 02:00hrs on 7 July, I received orders from BtlKdr I./SR 7 to support the attack by his battalion. I now moved in position 1km southeast of Height 145. At around 03:30hrs the attack was held up by heavy Russian defensive fire, while at the same time six heavy tanks [KV-1] attacked the battalion. I gave orders for the gun on the left of my position to open fire at the tanks. After defeating a sixth tank, the gun was destroyed by a direct hit from enemy artillery. Now my second gun changed position and defeated a further six tanks, which had bypassed



Above: Built on the chassis of the SdKfz 8 heavy half-track tractor, a *BunkerFlak* was a massive vehicle. Armed with an 8.8cm FlaK the type provided the mobile heavy firepower that was invaluable to German forces advancing into Russia.

Right: The crew of this *BunkerFlak* has attempted to conceal its towering outline with a layer of foliage. In the background is an SdKfz 253 armoured observation vehicle from an artillery unit.



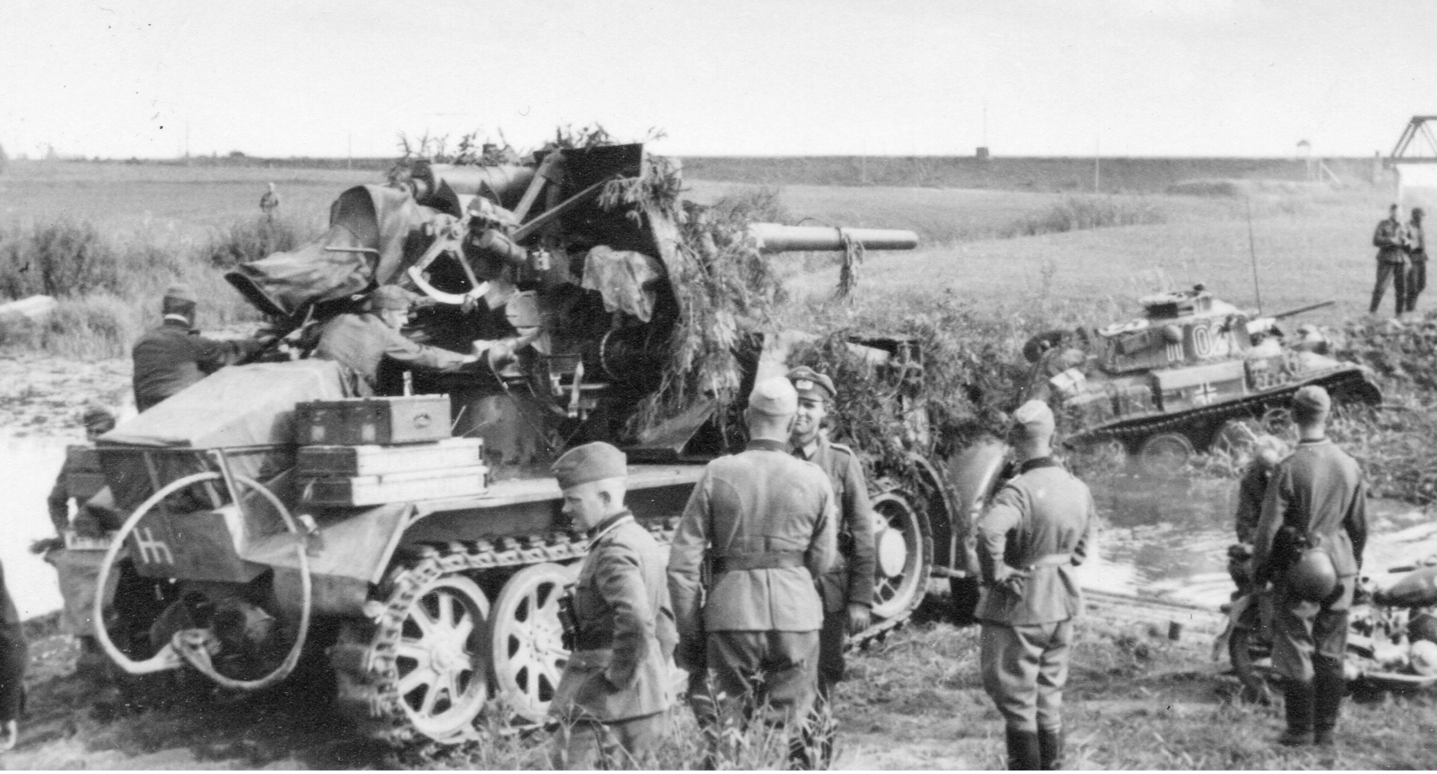


An 8.8cm *BunkerFlak* leads a tank column through a village in Russia. Although prohibited, the type was often used as a lead vehicle ready to engage Soviet tanks at long range. Both the PzKpfw III and PzKpfw IV lacked firepower.

> Height 145 from north. At around 05:00hrs, another 25 tanks attacked from the east. To counter this threat, I moved my gun into position and destroyed six tanks, forcing the rest to retreat. After a further change of position I destroyed another five tanks, which had been attacking the battalion's command post. Since the command post was no longer in danger, I moved position and destroyed another four tanks.
>
> *Leutnant* Kropka, Platoon commander

For his actions Kropka was awarded the Knights Cross. On 12 August 1941, the commander of 7.PzDiv wrote a letter of appreciation:

> To
> 1./PzJgAbt 8
>
> From 29 June until 8 August the 1./PzJgAbt 8 fought in association with 7.PzDiv. The unit was led in an exemplary forward-looking manner and was always courageously efficient in combat, and was involved in the division's defensive battles. Names including Szolevicze, Vitebsk and Jerzevo will forever remain milestones in the history of the unit.
> During the morning of 7 July 1941, as the great tank battle being fought around Behenkovitshi and Vitebsk raged, the unit managed to destroy 34 of some 200 attacking enemy tanks in a very short time.



A PzKpfw 38(t) appears to have foundered as it attempts to cross a wide stream. Should the 8.8cm *BunkerFlak* suffer a similar fate, recovery of this valuable battle asset would be a lengthy procedure.

Often deployed within our forward columns, the enemy lost large numbers of trucks, guns and heavy infantry weapons to our 8.8cm guns manned by courageous crews. We all owe much to them and their commanders.

The unit suffered a number of losses, but these are outweighed by their success.

My best wishes to the company

Generalmajor Hans Freiherr von Funck

PzSfl IVa and PzSfl V

PzJgAbt 521, one of seven *Heerestruppen Panzerjäger-Abteilungen* (army troop tank destroyer battalions) equipped with 27 PzJg I guns, was reinforced with a platoon equipped with two 10cm Kanone auf Sfl (PzSfl IVa), which had been delivered shortly before Operation *Barbarossa*. After a short time, members of the unit began calling the heavy tank destroyer 'Dicker Max' (Fat Max).

The unit was sent to the southern sector of the Ostfront and individual PzJg I companies were attached to various units to assist them with fighting enemy tanks. Both Dicker Max guns were deployed to obliterate field fortifications or to attack any Russian tank which entered the action. However after a short time on the battlefront, one was lost due to an internal explosion.

An after-action report dated 2 September 1941 details the problems of defeating the T-34 (the Germans used several designations, such as 26 or 32 tonner, while at the same time identifying it as a heavy tank):

Experience report on the defence against Russian tanks between 29 and 30 August 1941

A. Combat

During a Russian attack on 29 August 1941 a 4.7cm *Panzerjäger* (Sfl) was destroyed at a range of 120m by a Russian tank., two officers and a sergeant from other units were standing on this *Jäger* [*Panzerjäger* self-propelled gun], shouting divergent information to the commander, which hindered him in making a calm assessment of the situation. For this reason he could not open fire although the enemy tank needed time to turn his turret. A short time later, the Russian tank was engaged by a *schwere Jäger* [Dicker Max]. Both commander and gunner received separate instructions, and thoroughly assessed the situation. Thus it was possible to hit the tank in the side at very close range. The shell penetrated the hull starting a fire and the tank burnt out completely.

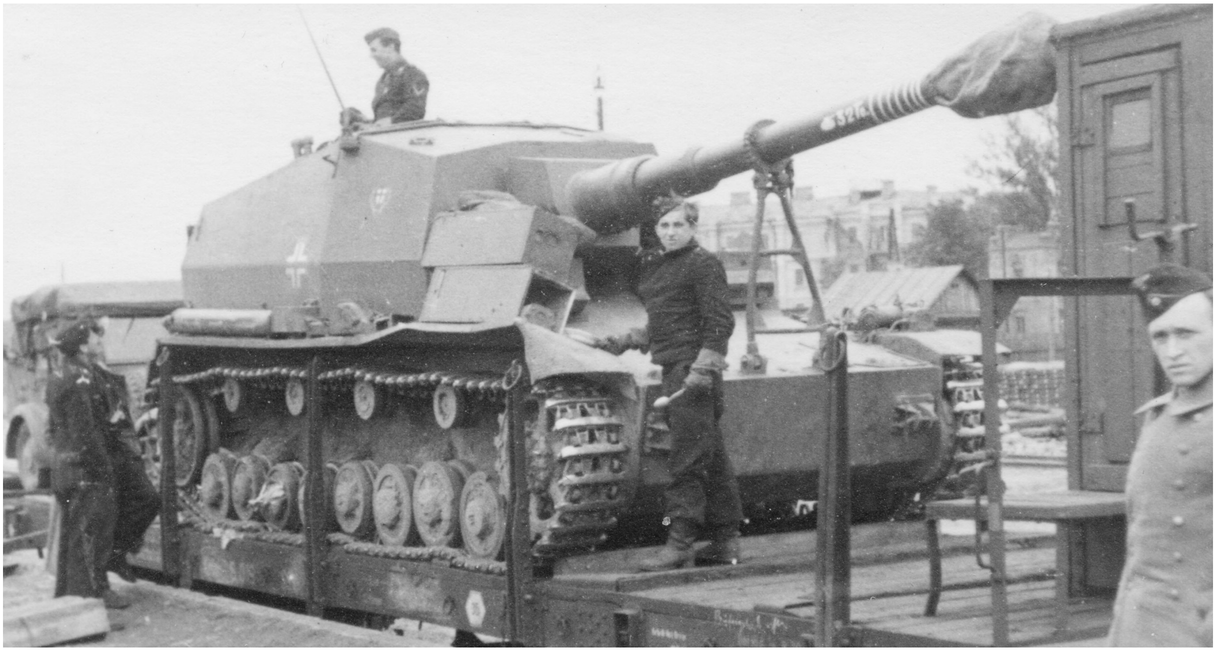
At 13:00hrs another heavy tank was observed near Devitchi at a range of 1,000m, and was subsequently engaged by the *schwere Jäger*. A clear Panzergranate (*rot*) hit was observed, but it did not catch fire. The tank remained immobilized and did not open fire again, but during the night, it was recovered by the Russians. On 30 August, a length of badly damaged track from a Russian heavy tank was found in the area.

On the same day during an attack on Makov, a Russian heavy and two light [T-26] tanks were engaged by a *schwere Jäger* at a range of some 1,200m. Heavy fire from enemy anti-tank guns prevented the *Jäger* from getting any closer. The heavy tank, which had been immobilized by hits, remained there until evening. But both light tanks had escaped into the forest and during the night the heavy tank was recovered by the enemy. A number of moving tanks were fired at with the range scale set at 1,500m without success. Later two Russian heavy tanks were fired at without success with the range scale set at 2,000m.

In the south of Voronezh, a 4.7cm *Panzerjäger* (Sfl) was suddenly engaged by a Russian BT tank as it turned a corner and approached at high speed. The driver stopped the *Jäger*, to allow the commander to fire two rounds. After the first hit, two men abandoned the BT; after the second hit, the now burning tank ran into the *Jäger*, tearing a piece out of the hull. The driver reversed the *Jäger* preventing it from catching fire.

B. Conclusions

1.) The commitment of the two 4.7cm *Panzerjäger* (Sfl) show that leaders of other units must never be involved in combat, as they impede the commander from making vital decisions. This is the only reason why the *Panzerjäger* at Shostenkij did not open fire even though the enemy tank was not moving.



Photographed in the late summer of 1941, the sole remaining PzSfl IVa (Dicker Max), has been loaded on a railway wagon. The victory rings painted on the gun barrel, after recent fighting, represent eight T-34 kills.

2.) Before the *schwere Jäger* enters the battle, a thorough reconnaissance of the terrain must be made by the commander or gunner on foot or by motorcycle in order to find the best firing position.

3.) Moving targets can be hit only at short range. The traverse of the gun is only 9° to each side making it impossible to hit a target approaching from the side.

4.) Any target at over 1,000m range should not be fired on as the penetration of a heavy tank is questionable; hits can barely be observed. At ranges over 900m the size of the target in the gunsight will decrease. This problem will be worsened when the target is below the firing position.

5.) For firing at targets at ranges over 1,000m, an artillery-type rangefinder is very necessary.

6.) The commander's *Turmzielfernrohr* (turret telescope) proved to be unusable. It should be replaced with a *Scherenfernrohr* (scissors periscope).

7.) The experiences made on 29 and 30 August show that the enemy does not always destroy their immobilized tanks, but will recover them at night.

8.) A lack of PzGr(*rot*) [high-explosive and armour-piercing] ammunition did not allow us to continuing firing at an enemy tank to ensure it was totally destroyed. Currently we cannot be resupplied with the PzGr(*rot*), but we do have 70 rounds of PzGr available.

The report shows that the combat value of the 4.7cm PaK-armed *Panzerjäger* I, and the mighty Dicker Max, was limited due to a number of reasons.

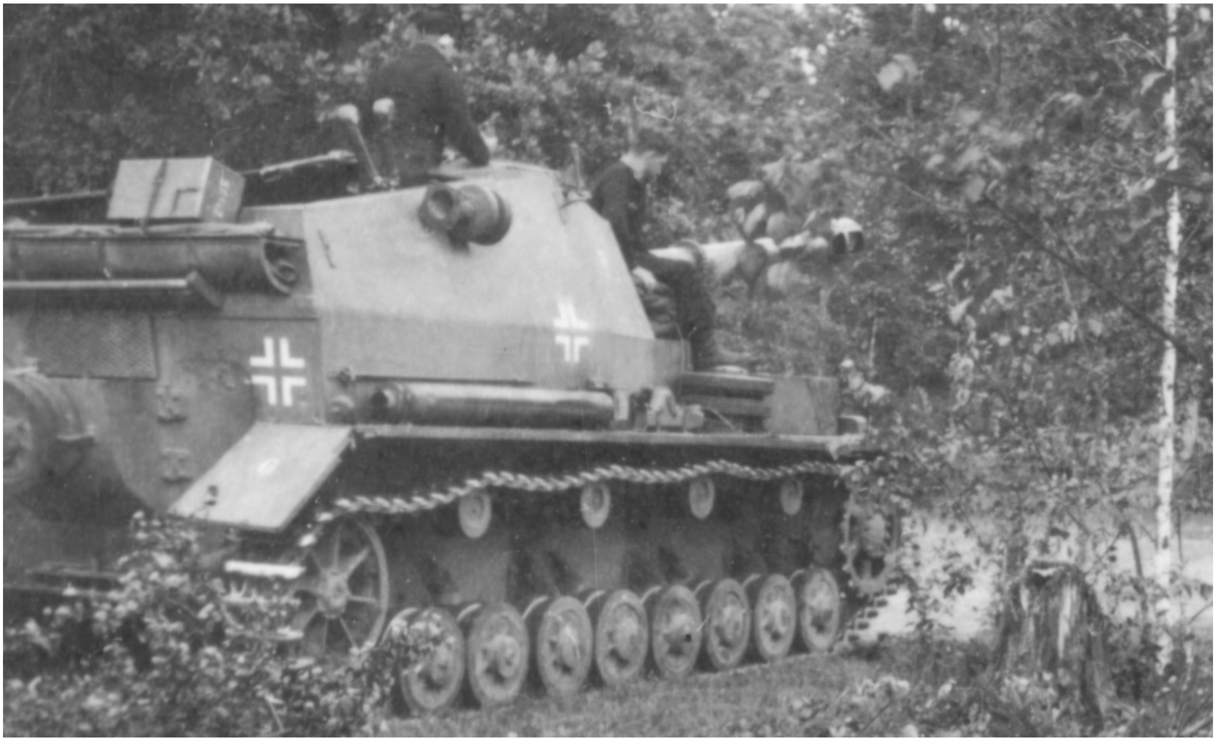
Despite the performance of both guns appearing to be excellent on paper, this did not translate to the reality of conditions on the Eastern Front. In theory, the 10cm PzGr (rot) ammunition should penetrate 138mm of armour at 1,000m range, but the sloped armour on the T-34 proved to be a problem.

Even worse, the overall design of the PzSfl IVa [Dicker Max] was extremely poor for a mobile heavy gun. A serious problem was the lack of effective vision devices including a gun-sighting periscope not suitable for pin-point targeting. A major problem was that the vehicle was seriously underpowered, causing the engine to constantly overheat, and the weight of the vehicle led to many failures of the final-drive units and transmission.

On 20 September, the Führer ordered that the remaining Dicker Max was to be transferred to those units laying siege to Sebastopol. After the city was captured on 13 November 1941, the vehicle was returned to PzJgAbt 521.

During May 1942, PzJgAbt 521 took delivery of two of a new type of *Schartenbrecher*; the enormous 12.8cm K40 L/71 auf PzSfl V – at first designated 12.8cm *Selbstfahrlafette auf* VK 30.01(H): (12.8cm self-propelled gun on VK 30.01 [Henschel]). The Rheinmetall-built 12.8cm FlaK gun had originally been designed to fight enemy aircraft flying at very high altitude, so it was extremely powerful. At that time PzJgAbt 521 had three heavy anti-tank SP guns in a platoon, and one *Kompanie* (KP – company) 3./521 equipped with

The PzSfl IVa was powered by a 180hp Maybach *Hockleistungmotor* (Hl – high-performance engine) 66 originally used for the PzKpfw II Ausf L *'Luchs'* (Lynx). Consequently the 22-ton self-propelled gun was seriously underpowered, having a power-to-weight ratio of only 2.67hp/kg.



the surviving 4.7cm PaK(t)-armed *Panzerjäger* I (nine, according to an order of battle, dated May 1941). Both 1.Kp and 2.Kp were earmarked to be equipped with the new 7.62cm PzSfl I or II [Marder], but delivery of these vehicles continued at a very slow pace.

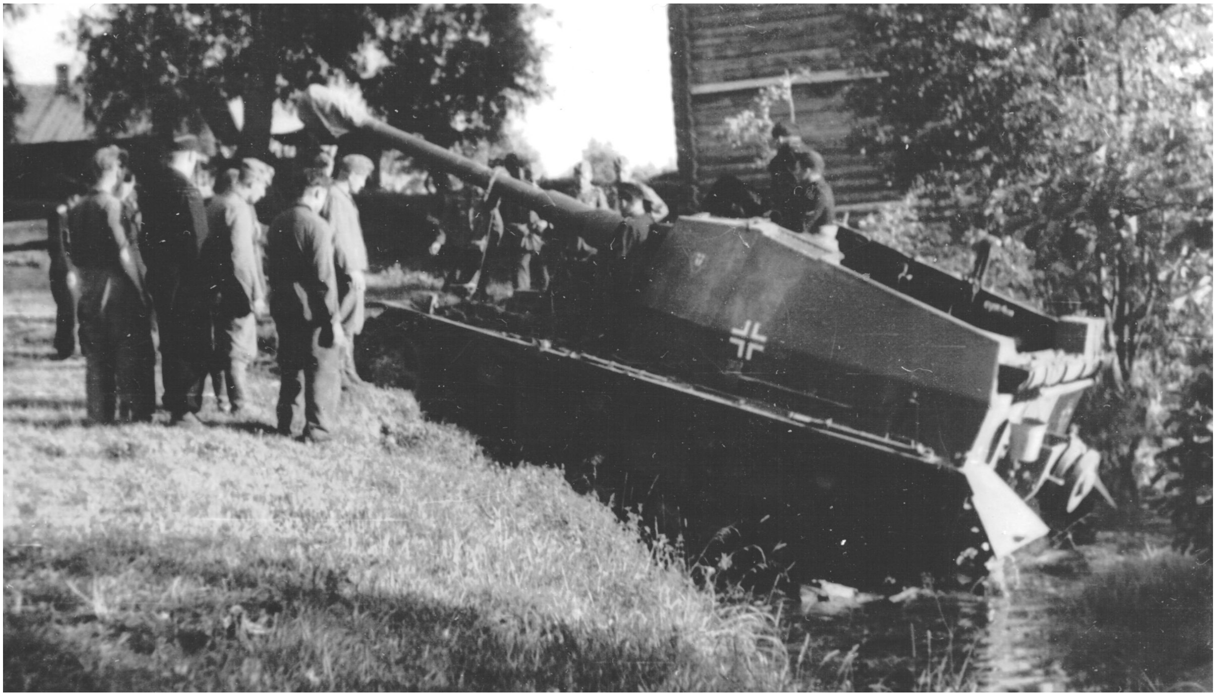
The 12.8cm K40 L/60 fired standard high-explosive shells to attack reinforced targets (bunkers) and armour-piercing rounds to defeat enemy armour: the powerful and highly accurate gun almost guaranteed success. But there were problems with mobility; the long length of the tracks made steering in mud difficult, placing a great strain on the engine and transmission.

Both the Dicker Max and the PzSfl V had been designed to a strictly-defined specification. High mobility was not priority, so engine power was kept to a minimum and only sufficient for the vehicles to move position during combat.

Compilation of experiences of the defence of T-34 and KV

Source: War diary of 252.InfDiv, two files dated 3 August and 27 October 1941

Weapon	Ammunition	Maximum combat range	T-34	52 Tonner
le MG 34 MG 34	s S s heavy pointed bullet	1,500m	no information given, arguably similar to 52 Tonner	Fire against vision ports and hatches impede observation. Accompanying infantry will be seperated from tank
Karabiner 98k le MG 34 s MG 34 Panzerbüchse	SmK pointed bullet steel core SmK H pointed bullet hard metal core	150m	no information given, arguably similar to 52 Tonner	Fire against weak points, engine ventilation louvres, vision ports, tracks and suspension
2.8cm s PzB 41	tungsten round	100m 300m	Turret hull side	No information given
3.7cm PaK	3.7cm PzGrPatr 40		75m at turret 100m at hull side	Weak points, engine ventilation louvres, vision ports, tracks and suspension
4.7cm PaK(t)	4.7cm PzGrPatr 40		200m at turret 500m at hull side	50m at turret 200m at hull side and rear
5cm PaK 38	5cm PzGrPatr 39 5cm PzGrPatr 40 to be used only against 52 Tonner		600m at turret 1,000m at hull side 300m at rear	
5cm PaK 38	5cm PzGrPatr 40			250m at front 400m at side and rear
8.8cm FlaK 18/36	8.8cm PzGrPAtr		1,000m at turret front 100m at hull front 1,000m at turret side 1,500m at hull side 700m at rear	1,000m at front and rear 1,500m at side



Due to a lack of engine power a PzSfl IVa has been unable climb a river bank and would have to be hauled out by recovery vehicles.

Despite the many operational problems with the PzSfl IVa and PzSfl V, battlefield experience gained helped to set the standards for a new 'family' of self-propelled anti-tank or artillery guns.

A photograph dated January 1943 shows that a 12.8cm PzSfl V was in combat around Stalingrad (the other had been destroyed in the fighting), and markings on the gun barrel show 15 kills.

However, due to the low number built, their importance to the *Panzerjägerwaffe* was not significant.

Shortage of Tractors

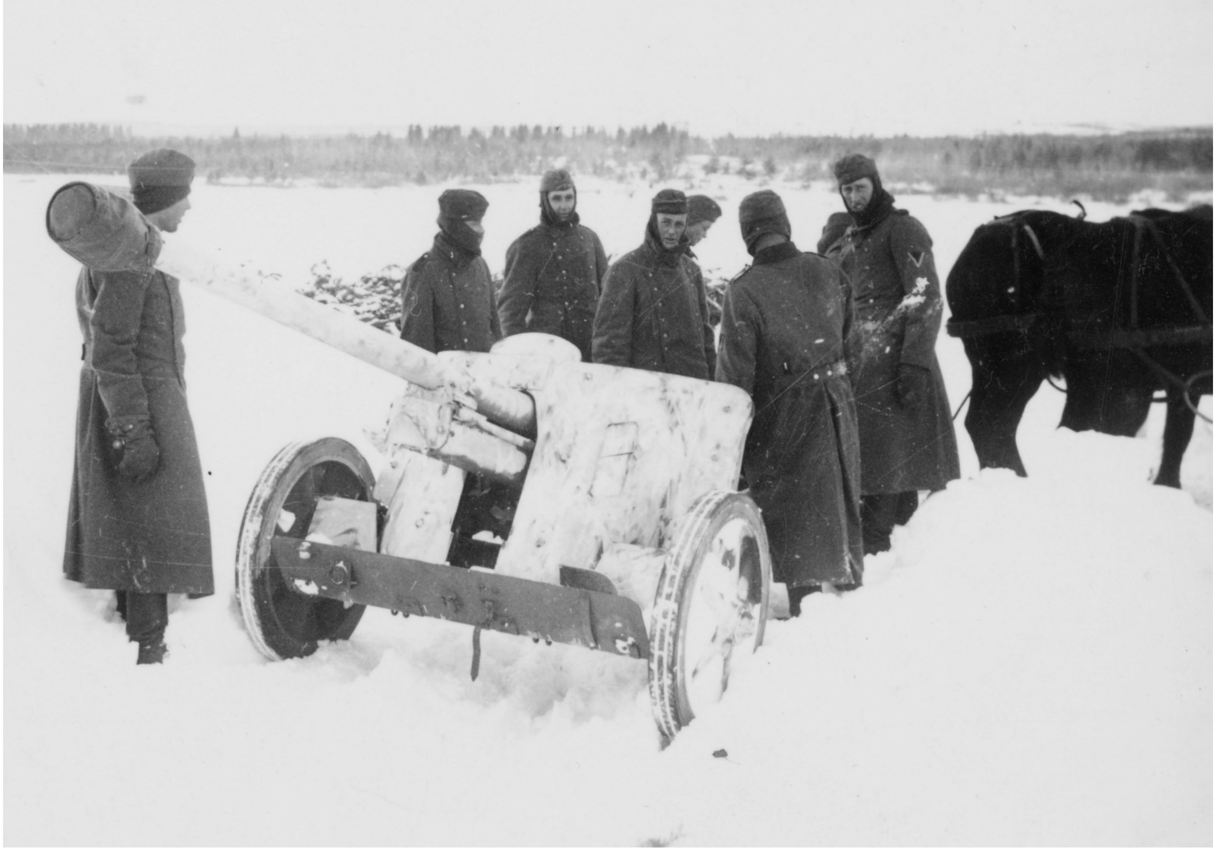
The *Blitzkrieg* tactics employed by German forces in earlier campaigns had shown that mobility was a crucial factor in modern warfare; however the extreme conditions met during the first months of Barbarossa would change everything. From the beginning, the campaign in the east would be influenced by the inability of German industry to deliver sufficient replacement motor vehicles for those lost in action.

The terrain and climate conditions of western Russia would only exacerbate even the smallest problem. The summer had already brought heavy rain, which turned all roads and tracks into almost bottomless mud; the problem occurred again during the *Rasputitsa* (mud season) of autumn. The onset of winter brought with it even more problems as the extremely low temperatures began to affect men, equipment and the distribution of supplies.

In August 1941, the OrgAbt delivered an alarming statement:

> The original planning expected a rapid accomplishment of the Russian campaign. Establishment of new units, especially among the *schnelle Truppen* [[rapid formations], had long been decided. For this reason it was initially planned not to resupply soft-skinned vehicles to the army in the east. Due to experience gained during recent campaigns it seemed likely that the number of total losses would remain within sustainable limits allowing the affected forces to continue with their missions until end the of the operation.
>
> However, the determined resistance by the Russians; the inconceivably bad state of the roads, and the extremely long distances has destroyed this point of view. Many vehicles were already obsolete at the beginning of the invasion; especially the large number of commandeered French motor vehicles which were unsuitable for the conditions. All of the above has brought the number of total losses to critical.

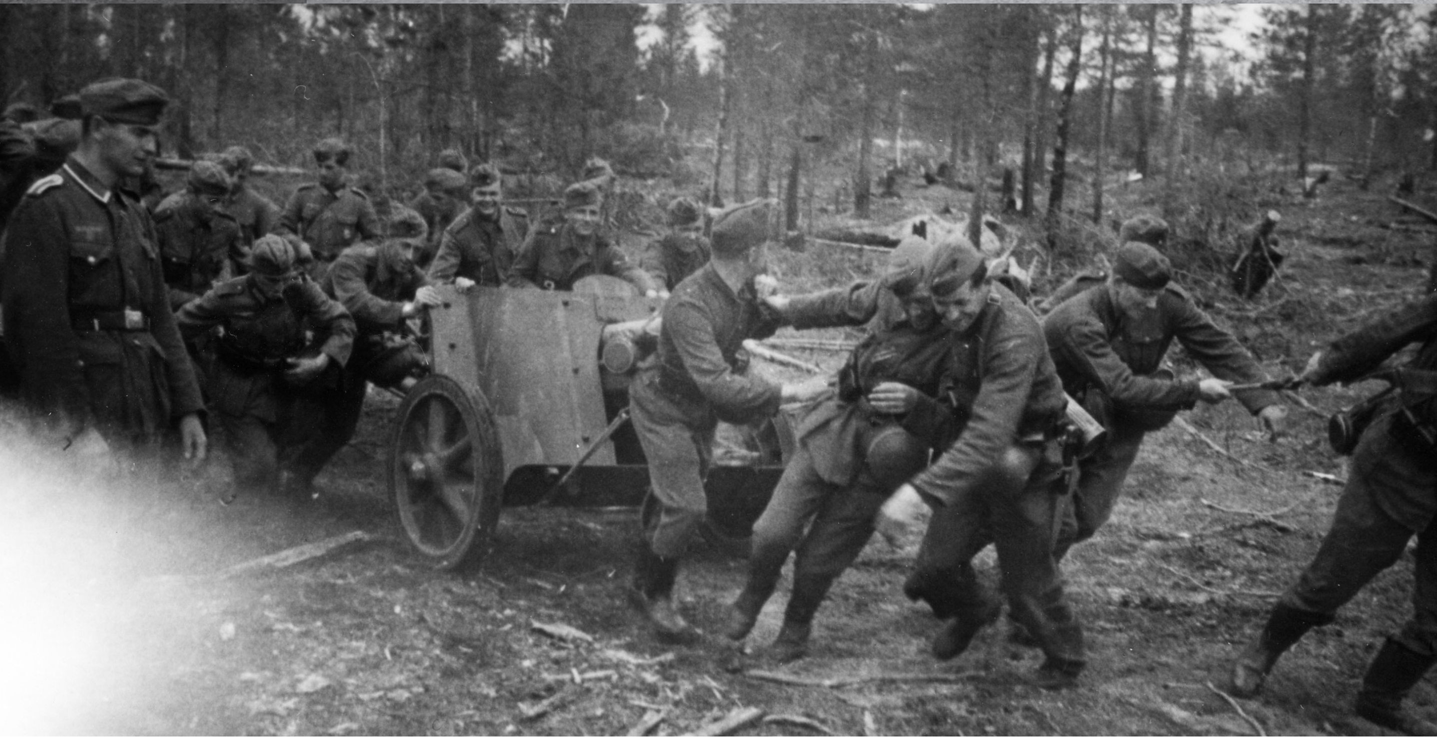
According to Hitler the campaign in the east should have been achieved before the onset of winter. Here inadequately clothed German troops attempt to move a 5cm Pak 38 with the assistance of a horse.



Deep snow hinders the movement of the gun crew as they move this 3.7cm PaK to a new position. The leading soldiers have their shoulder harness attached to the the carriage to haul the gun, while the other two push.

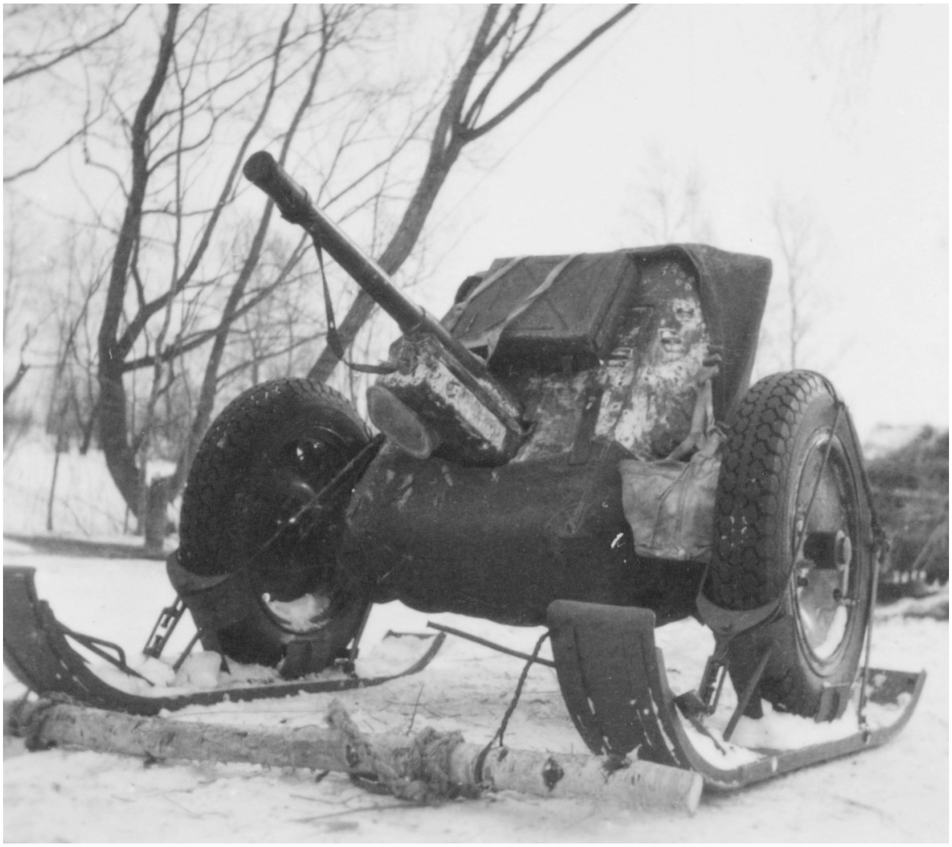
> This development forced OrgAbt to release a number of military specification vehicles by the end of July: 300 trucks, 500 passenger cars, 500 motorcycles and 20 all-terrain types. As losses continued to increase, the head of the OrgAbt was forced to release a further 1,000 motorcycles, 500 passenger cars, 600 trucks and 50 prime movers. Furthermore requests from a number of individual units seriously lacking vehicles were fulfilled. For instance 18.PzDiv, received 50 trucks. A number of infantry divisions were issued with 60 prime movers to replace failed French-built Chenilettes, which they had been using as towing vehicles for anti-tank guns.

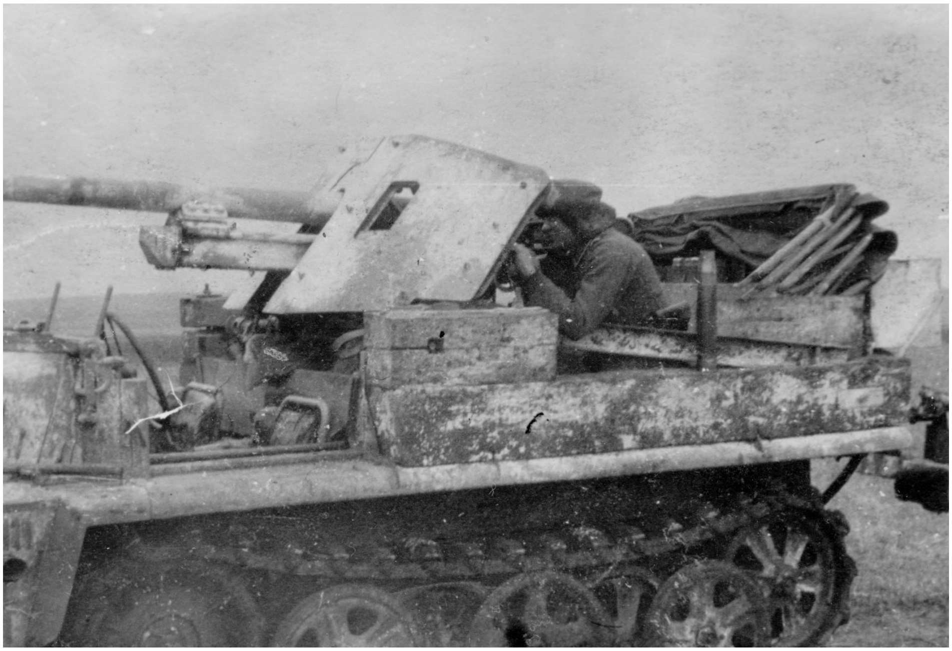
It must appear incredible to any observer that, in July 1941, the OrgAbt decided to halt the supply of motor vehicles to units fighting in the east, long before the end of the campaign was in sight. The mention of foreign-built vehicles being unsuitable is somewhat strange, as archival material strongly suggest that the *Wehrmacht* would never have got to Moscow without large numbers of captured, then rebuilt, British and French soft-skinned vehicles.



Above: The 5cm PaK 38 was too heavy to be pulled by the crew only. If no motor vehicles were available, then assistance was called for – more than 10 soldiers haul the gun into position.

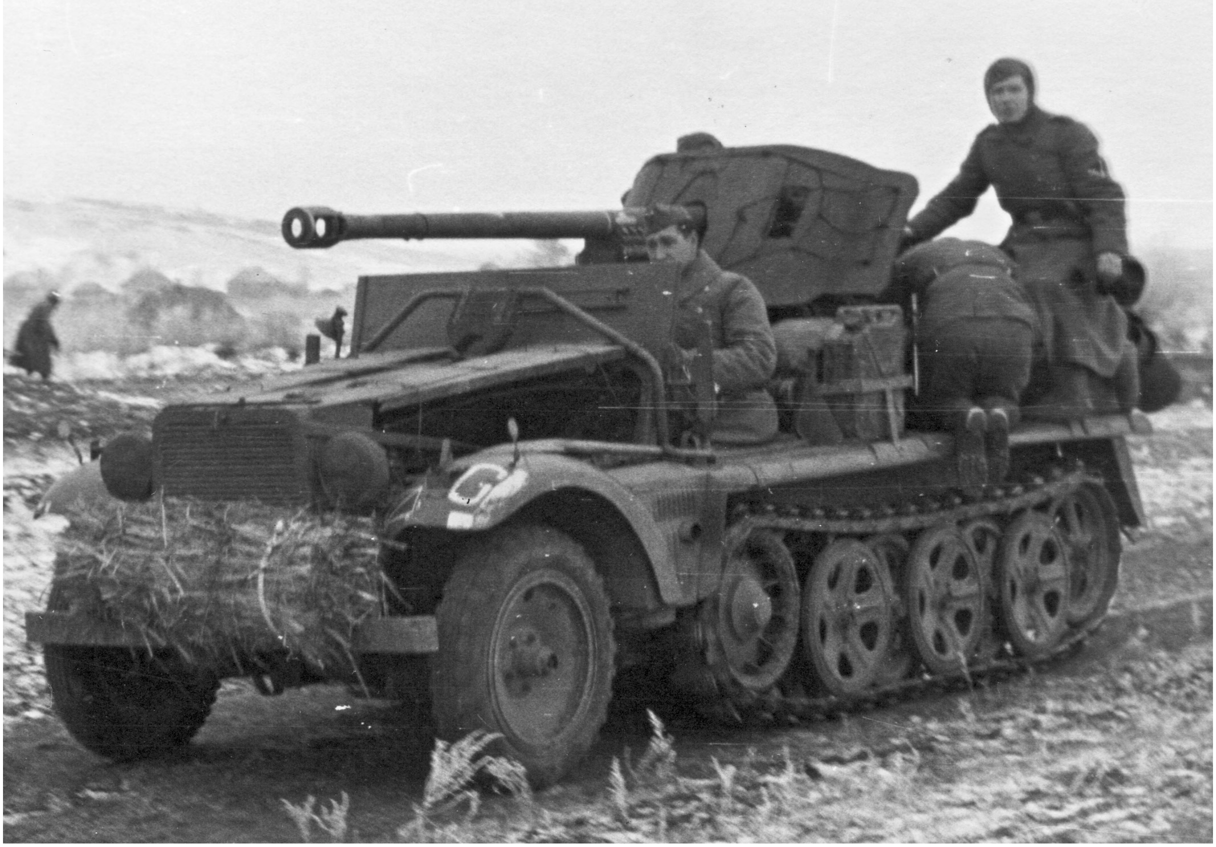
Right: A 3.7cm PaK mounted on snow skids to enable it to be moved by horse or motor vehicle. The item became available during the first winter, and were either factory built or fabricated near the battlefront.

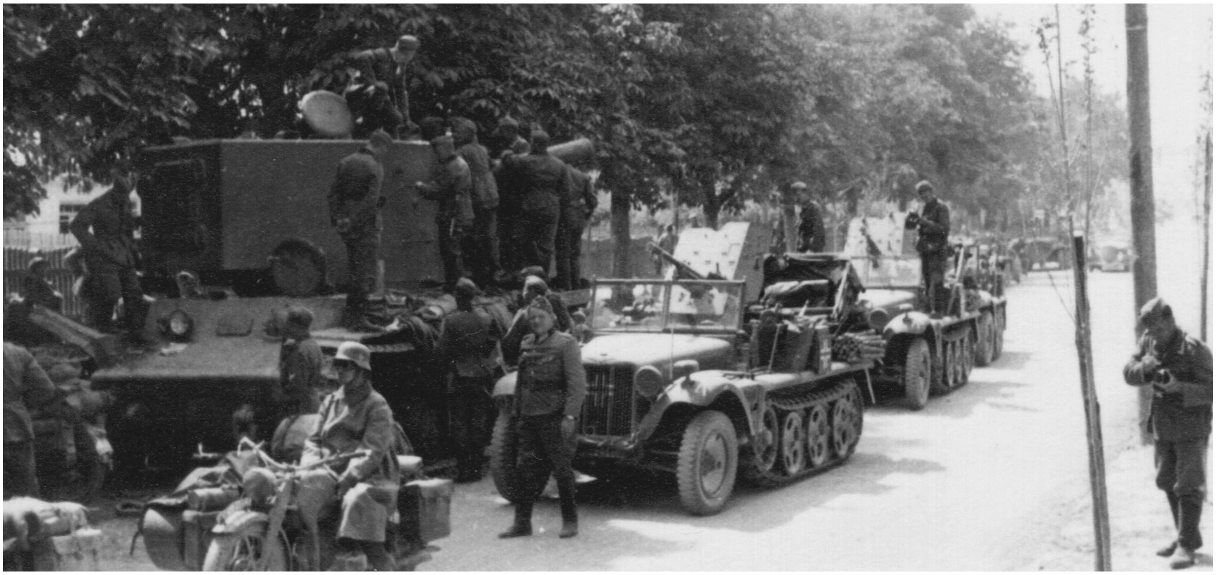




Left: Here the crew has mounted a 5cm PaK 38 on their SdKfz 10 and stabilized the gun with heavy baulks of timber.

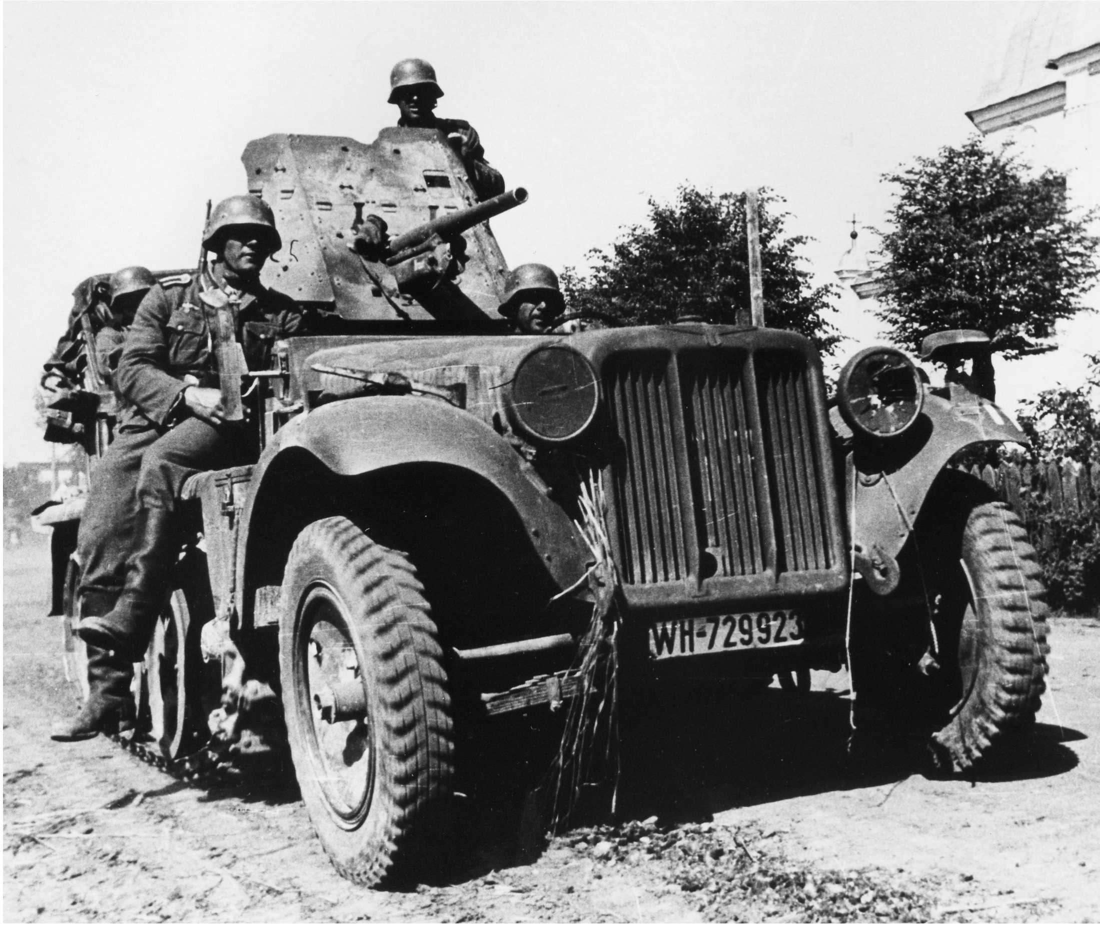
Below: The longer the invasion of the Soviet Union continued the worse conditions became, and autumn turned to into winter. Mobility became a serious problem, which required some innovative solutions. Although not officially approved, many gun teams mounted the weapon on their tractor; here a 5cm PaK 38 has been mounted on an SdKfz 10.





Above: Three modified SdKfz 10 armed with the 3.7cm PaK pass a KV-2 heavy tank, which has been abandoned by the Russian crew.

Right: An SdKfz 10 from 7.PzDiv, mounting a 3.7cm PaK. There was no 'standard' – or officially approved – method for this type of modification.



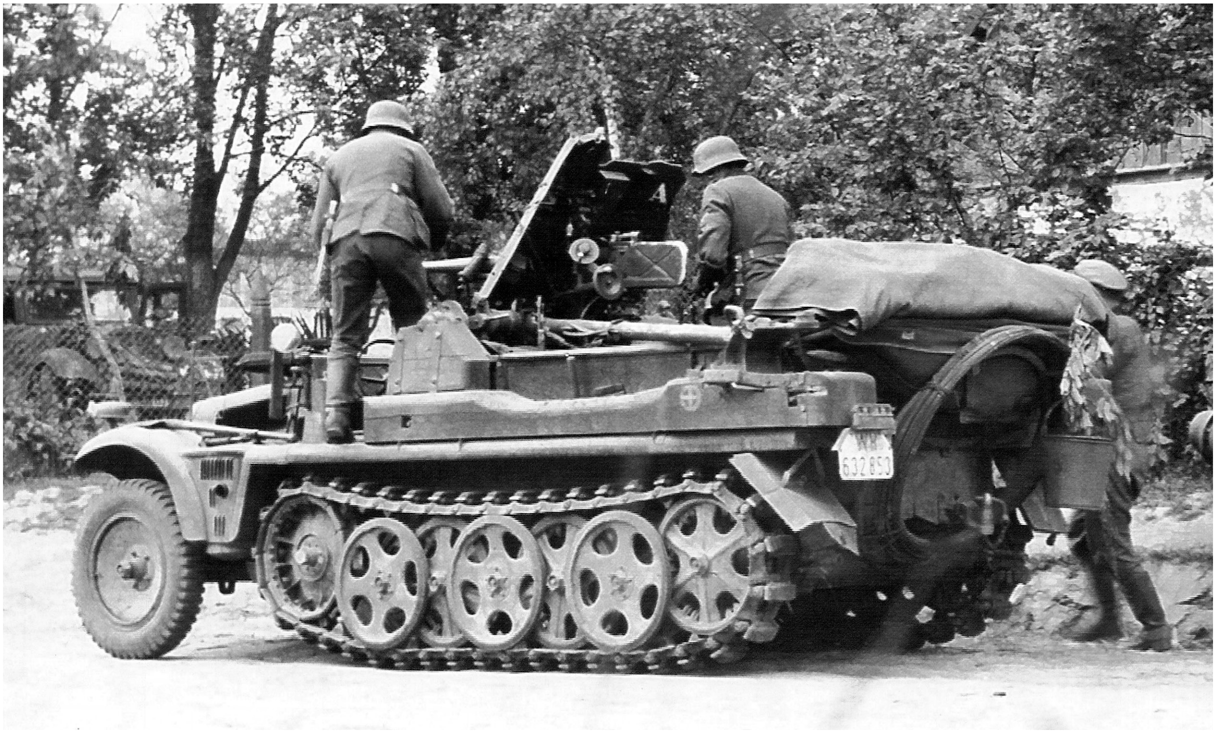
In November 1941, the situation for German forces worsened. As a result the commander of 4.Armee issued explicit orders; here to 268.InfDiv:

> Subject: *Infanterie Panzerjäger-Kompanie*
>
> The situation with soft-skinned vehicles requires severe measures to be taken. In the near future, we have to be prepared for the Inf PzJgKp to lose some if not all of its motor transport.
>
> All units are ordered to collect and retain all suitable *Beuteprotzen mit Bespannung* [captured carts, horses and tack]. Besides collecting booty, all staff at HQ, corps and divisions will also ensure that any limbers [carts] suitable for carrying/towing the [captured] Russian 7.62cm, or our 5cm and 3.7cm PaK will be secured.

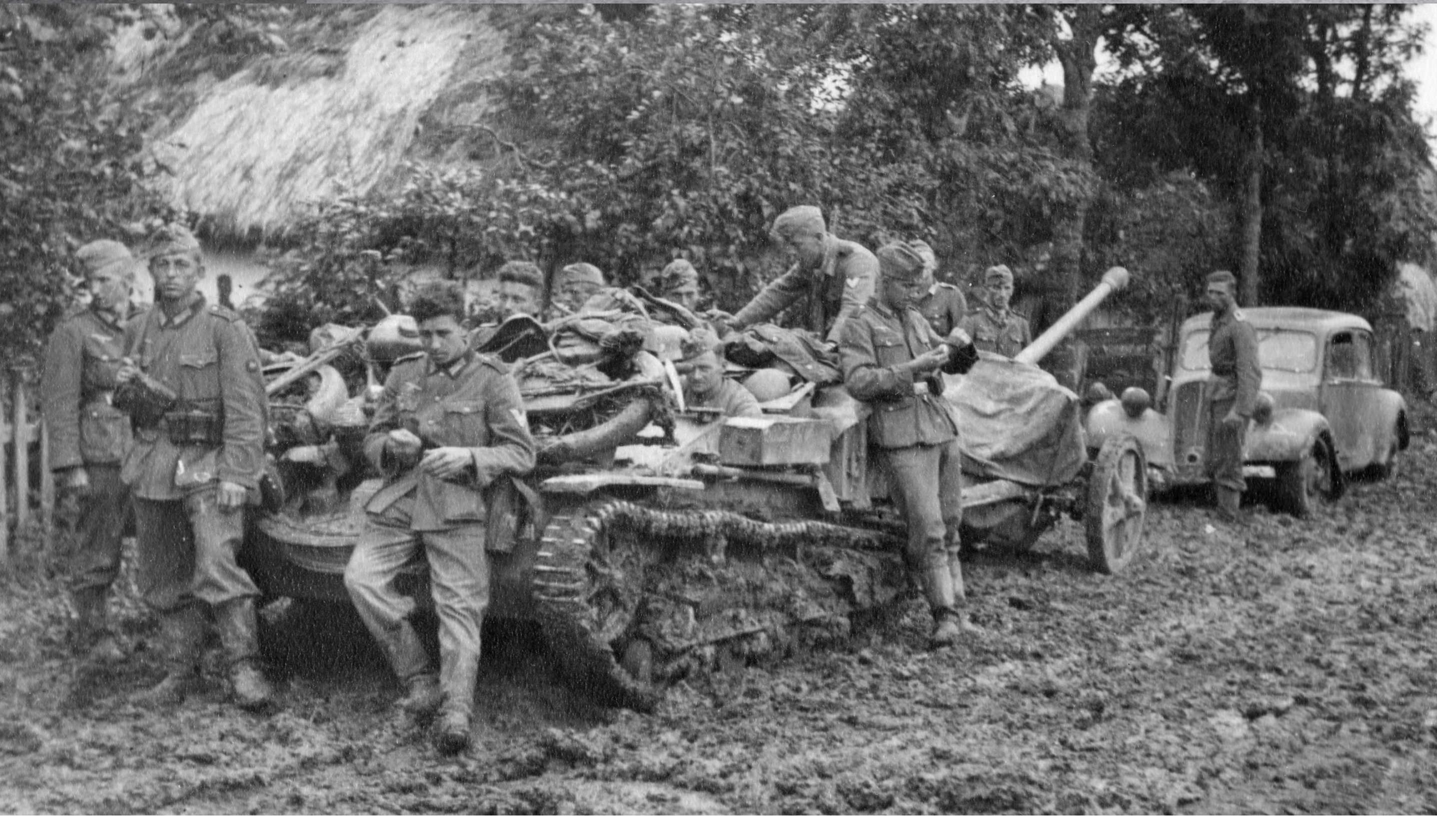
The situation had become that desperate.

Improved Anti-tank Ammunition

The combat value of the 3.7cm PaK anti-tank gun had decisively decreased since the beginning of Operation *Barbarossa*; even the replacement 5cm PaK was not the solution for *Panzerjäger* troops fighting the latest Soviet tanks. The problem



The gun on this SdKfz 10 from 13.PzDiv has been mounted on and stabilized by heavy timber beams. Care had to be taken not to overload the vehicle as this would affect performance, particularly over rough terrain.



With the onset of the *Rasputitsa* (mud season), conditions made it impossible to use light field cars and also light trucks for towing. The Renault UE fully tracked tractor had a towing capacity of some 1,650 kg and was used to pull a 5cm PaK 38.

was exacerbated by the German armaments industry being unable to produce and deliver sufficient numbers of the 5cm PaK. To rectify the situation military planners initiated a two-fold strategy. Firstly and most importantly, production of a heavier calibre PaK was urgently required as part of the framework for the s PaK programme (see below). Secondly, but equally important was to improve the performance of existing weaponry and ammunition.

By the end of 1941, hollow-charge technology (the principle had proven very effective for defeating bunkers) was being used to a greater extent. In 1940, 15kg and 50kg had had been used to destroy armoured cupolas and blast through concrete bunkers; in 1942, the 3kg Hohlladungen (Hl) 3 was designed to destroy tanks. In 1941, work began on minimizing the size of the charge (without losing explosive power) to produce a shell for both tank and anti-tank guns.

Hohlladungen technology was used for a variety of applications, including in the introduction of new weapons and a number of improvements to existing weapons and ammunition. These included:

Gewehr-Granatgerät
Granatbüchse 39
7.5cm KwK (also StuK)
3.7cm PaK

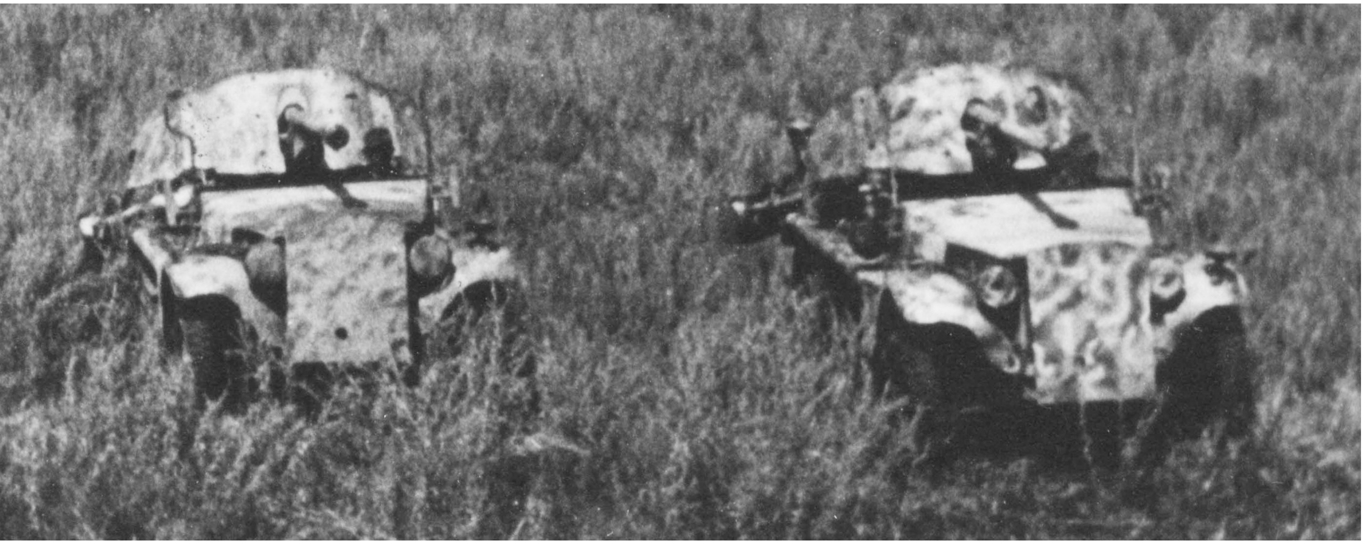
Gewehr-Granatgerät

In early 1942, a new infantry weapon was introduced, the Gewehr-Granatgerät (GewGrGer). It consisted of the *Schießbecher*, a small attachment which fitted on the muzzle of a standard 98k infantry rifle and allowed several types of grenades to be fired: a Gewehr-Sprenggranate (high-explosive grenade) for close-range use against targets which could not be effectively destroyed by infantry; a Gewehr-Panzergranate (GewPzGr – hollow-charge grenade) for close-range use against tanks and armoured vehicles or firing slots in a pillbox. To facilitate aiming the *Schießbecher*, a special gunsight would be mounted on the 98k.

An experience report dated 10 October 1942 stated:

> Test firing with GewPzGr against a Russian T-34
>
> I fired 12 GewPzGr rounds at various parts of a T-34 which had been abandoned on the Pogorelki road:
>
> 1.) Four rounds were fired at 50 to 75m distance against the hull, running gear and turret. A round penetrated the armour to a depth of 5cm with a diameter of 1cm, but failed to make a full penetration. Although the armour on a T-34 is only about 50mm thick, the slope of the armour had an unfavourable effect. It must be noted that any grenades fired from more than 50m range requires a well-trained rifleman. Aiming at the target requires calm concentration. This will not always be possible in the heat of battle.
> 2.) Four rounds were fired at the tracks and rear from a distance of 10 to 25m. Small pieces were torn out of the tracks, but the damage would not have immobilized

Two modified SdKfz 10 mounting the 5cm PaK 38; these small vehicles were certainly effective as *Panzerjäger*, but the type had to be deployed within certain tactical limitations.



A 3.7cm PaK mounted on an SdKfz 10: note the ammunition box stowed on the track guard.

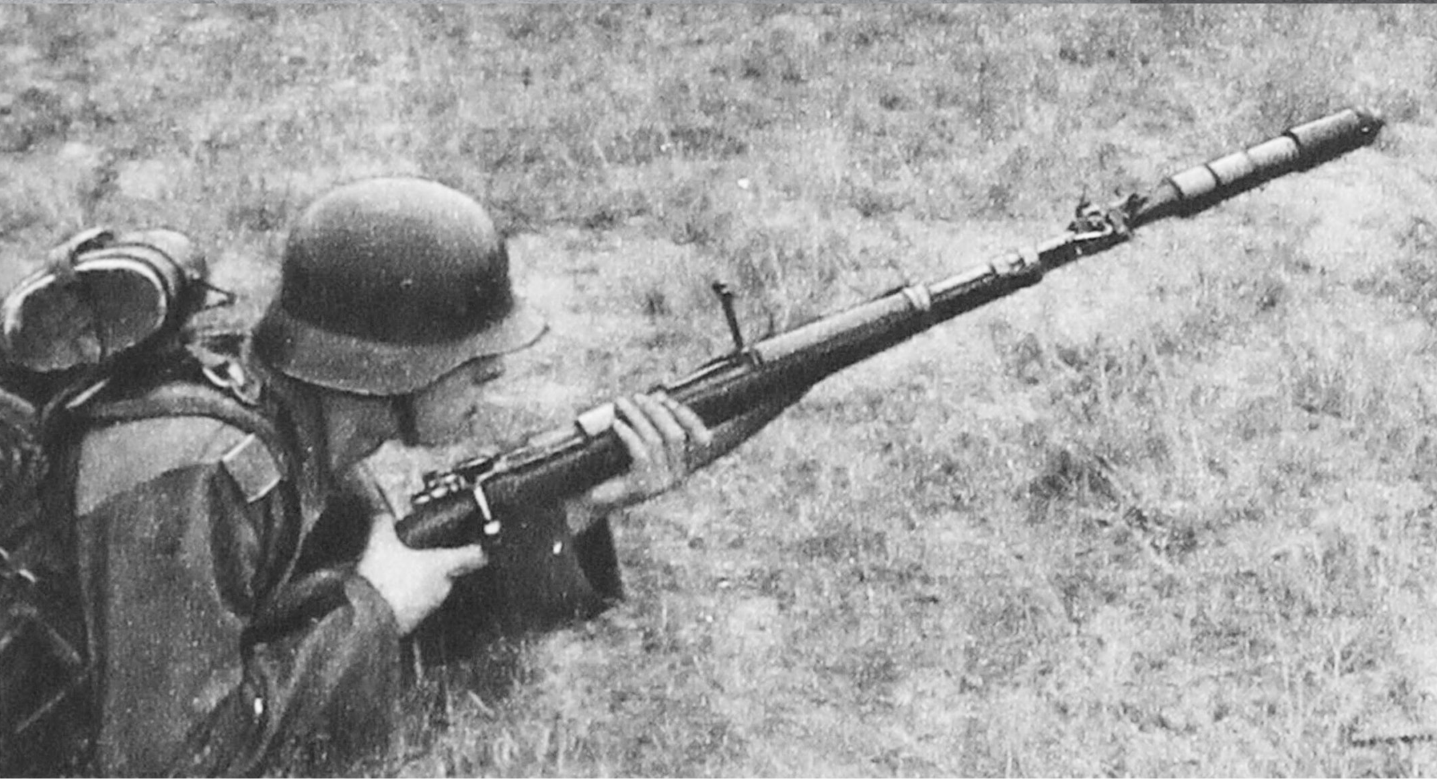
> the tank. The rear armour was too strong and could not be penetrated.
> 3.) Four rounds were fired at the side of the hull from a range of 10 and 20m. The 5cm armour was clearly penetrated and some thinner internal plating was torn to pieces by the splinter.
> In summary: it is advisable to fire from distances between 10 and 15m, and then only at the side of the hull, aiming between the running wheels.

This report shows that the Gewehr-Panzergranate had relatively good performance and was clearly superior to the Panzerbüchse 39: the splinter damage to the interior was not only destructive, but would be lethal for the crew. However, the sloped armour on the front and sides of the T-34 and the 80mm armour on the KV, ensured that both types were virtually impervious to any attack with a GewPzGr. This was possibly the reason why a new grenade was developed.

The *große* Gewehr-Panzergranate (gr GewPzGr), had a heavier explosive charge which required a larger diameter casing.

A letter dated 17 July 1942, from *Oberkommando des Heeres* (OKH – army high command) to the SS-*Führungsamt* (SS leadership office) specified the following penetration data for the gr GewPzGr:

80mm at 60°
40mm at 40°



A *Schießbecher* mounted on a 98k, the standard infantry rifle. A standard Gewehr-Panzergranate (a high-explosive round was available) has been fitted in the device and is ready to fire. The propellant cartridges were loaded in the five-round magazine on the rifle.

The deflection on a target at 100m range was reported to be between 94 and 100m.

The cumbersome Panzerbüchse had originally been issued to German troops in mid-1940 as a portable anti-tank weapon, and although superseded by the PzB 38, both types were considered inefficient and almost obsolete. In June 1941, some 25,000 PzB 38 and 39 remained in service [source *Überblick den Rüststand des Heeres*], but how these were allocated is difficult to define. An order of battle written in May 1941, shows that *Maschinengewehr* Bataillon [MGBtl – machine-gun battalion] 200 of 5.leDiv (*Afrika*) had 18 PzB 38/39 anti-tank rifles.

However, a *Heereswaffenamt* [army ordnance bureau] document, dated February 1942, provides some interesting detail:

> Panzerbüchse 39
>
> The penetration power of the PzB 39 (30mm at 100m when hitting armour plate at 60°, and 40mm at 100m and 90°) is no longer sufficient against recently encountered Soviet tanks. However it can be still used against a heavily armoured tank if it is aimed at vision devices, open pistol ports, the turret gap, sides of the hull or external fuel tanks. A method of improving performance is currently being tested. A new 15mm Panzerbüchse will not bring any improvement, since the increased weight [31kg] of the weapon is not in proportion with any increase in performance. Only the s PzB 41 appears suitable as a replacement for the PzB 39.

These lines seem to be partly contradictory, but in the last consequence it was a confession of the uselessness of the conventional German anti-tank rifles.

This development is seconded by an experience report on German tank destroyer weapons submitted by 88.InfDiv on 23 March 1942:

> According to the orders, we herewith report our wishes and suggestions referring to organization, armament and tactical experiences of the infantry:
> 2.) Weaponry for the *Schützenkompanie* [SchtzKp – rifle company].
> The introduction of an automatic rifle for the SchtzKp (one per section) is considered appropriate. Captured Russian rifles [possibly PPSH] were used with good success, especially at reconnaissance and raid missions…
>
> The Panzerbüchse shows such weak performances, that we can forego it. The troop does not trust it, leaving it on the vehicle when going into combat.

On 11 February the OrgAbt noted in the war diary:

> Beginning in mid-December 1941 the *Schießbecher* firing Gewehrgranate was issued to the O*stheer* [army in the east].
> Since the new Gewehr PzGr shows outstanding performances, it will get the standard anti-tank defence weapon of the infantry. We demand the allocation of *Schießbecher* at a rate of one per rifle section for all rifle units on all fronts. Later two shall be issued, making the le Granatwerfer or possibly even the hand grenade obsolete.

On 19 May 1942, the OrgAbt ordered that all PzB 39 were to be withdrawn from the O*stheer* and from Panzer Armee *Afrika*. At around the same time, OrgAbt stipulated that the PzJgAbt was to be supplied with an increased number of mines in order to prevent the gun positions from being overrun.

Granatbüchse 39

The relatively good performance of the Gewehr-Granatgerät, combined with it being easier to handle, led to a number of changes. As large numbers of the PzB 39 were still in service, it was decided find out as to whether this weapon could be modified to fire the GewGrGer. Since both Panzerbüchse and GewGrGer had the same 7.92mm calibre it proved to be feasible. After shortening the barrel of the PzB 39 from 1,085mm to 590mm, the end was threaded so that a *Schießbecher* could be screwed on. The new weapon received the designation Granatbüchse 39 (GrB 39).

This new weapon now gave the front-line infantry the means to attack the T-34 and KV tanks at close range. The stated maximum combat range proved to be optimistic, and a strong crosswind would force the weapon off target.

On 31 March 1943, *Heeresgruppe Mitte* (Army Group Centre) published an after-action report from an unknown unit:

> Experience report on using the *große* Gewehr-Panzergranate.
>
> At ranges over 30m accuracy will decrease; this would also be affected by the speed of the tank and also terrain conditions.
>
> The round penetrated 50mm of armour at 30m range. The detonation left a 10mm diameter hole, comparable to the HL 3 [3kg *Hafthohlladung*]. Damage to the interior of tank is comparable.
>
> The troop is satisfied with the new ammunition, which allows the destruction of tanks at close range without being forced to attack using the T-mine or Hl 3.

This report concludes with a note stating that the new ammunition had only been available to front-line units since mid-March 1943. However, this is disputed in the content of earlier reports, while other documentation laments the low supply of gr GewPzGr.

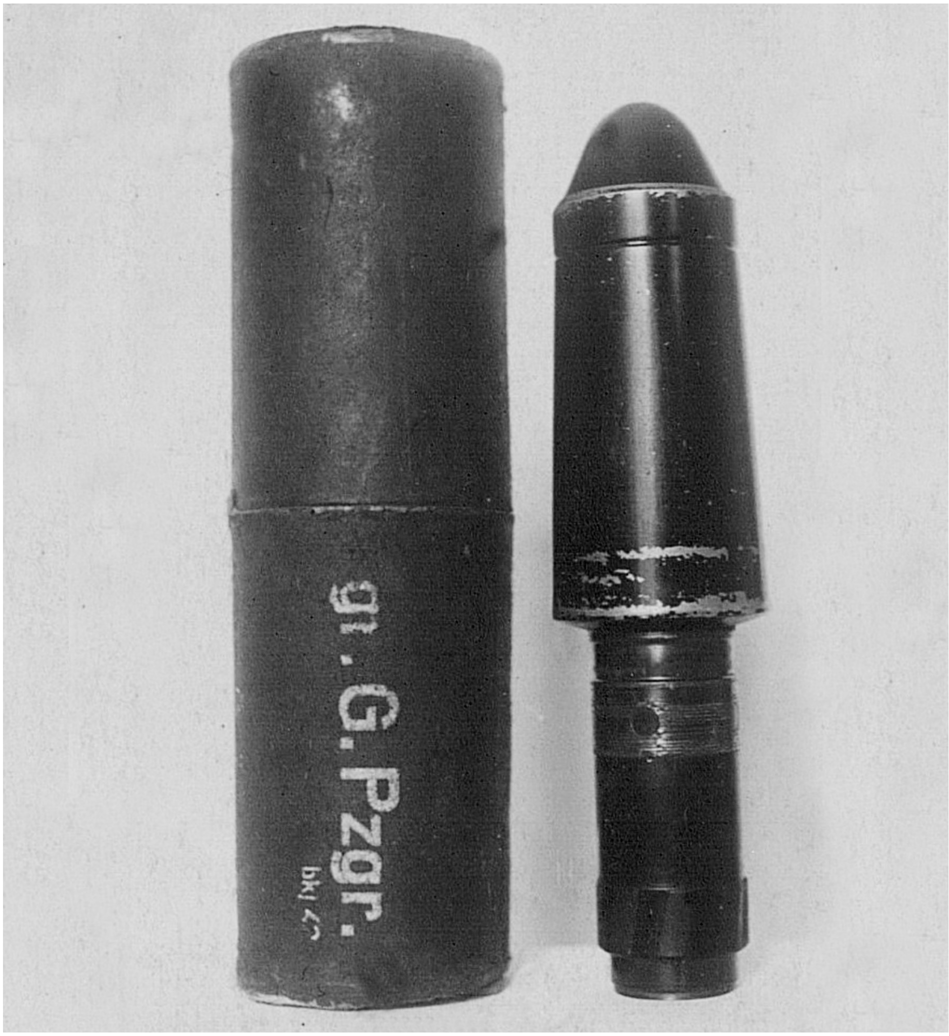
The new weapon certainly improved the anti-tank capabilities of front-line units when used with either the 98k carbine or the Granatbüchse 39.

7.5cm GrPatr 38 (Hl) for 7.5cm KwK and StuK

Although not used to equip the *Panzerjäger*, the 7.5cm KwK L/24 (also StuK) has to be mentioned. Originally intended as a support weapon, it fired high-explosive and smoke shells, as well as an ineffective armour-piercing shell. In December 1941, to improve anti-tank capabilities a new ammunition was introduced; the 7.5cm GrPatr 38 (Hl) hollow-charge round which would be continuously developed as the Hl/A, Hl/B and Hl/C. The 7.5cm GrPatr Hl/C could penetrate 100mm armour, but when compared to standard ammunition all hollow-charge rounds lacked range and had poor accuracy. Later, the same ammunition would be available for the long-barrelled 7.5cm KwK/StuK 40 L/43.

The 7.5cm GrPatr Hl, Hl/A and Hl/B were all modified for use with the 7.5cm *leichte Infanterie-Geschütz* (le IG – light infantry gun) 18, which fired standard artillery two-piece ammunition. Performance of the resulting 7.5cm Infanterie Granate (IGr) 38 Hl was dependent on muzzle velocity, which in case of the le IG 18 was 320mps limiting the effective range to 320m. Due to the ballistic characteristics of hollow-charge rounds, armour penetration was constant over the entire combat range. However, a low-velocity shell lacked accuracy, which resulted in a low number of hits. The original Hl round could penetrate 35mm of tank armour, while the improved Hl/A penetrated 75mm.

Later when the 7.5cm PaK 97/39 entered front-line service, the availability of Hl ammunition became most important.



The heavy (more effective) Gewehr-Panzergranate, had a performance which exceeded that of the PzB 39 anti-tank rifle. But combat was only effective at close ranges.

3.7cm Stielgranate 41

By autumn 1941, as the fighting in Russia continued, field commanders had become aware that the standard German anti-tank gun, the 3.7cm PaK was truly obsolete. Numerous after-action reports show how the troop had lost confidence in the weapon.

This extract from a report by 88.InfDiv recounts their experience:

> The 3.7cm PaK can no longer be used to combat the new types of Soviet tank. Even the four 5cm PaK 38, about to be issued to the infantry regiment, will not be sufficient to meet front-line needs, at least as long as there is no *Rotkopf-Munition* [red-head ammunition]. The panic within our infantry when facing attacking Russian tanks cannot be remedied by education and training; we quickly

> need sufficient numbers of better weapons. We consider the introduction of *Panzervernichtungstrupps* [anti-tank squads] as a useful additional force, but they are not a solution for the lack of adequate anti-tank weapons.

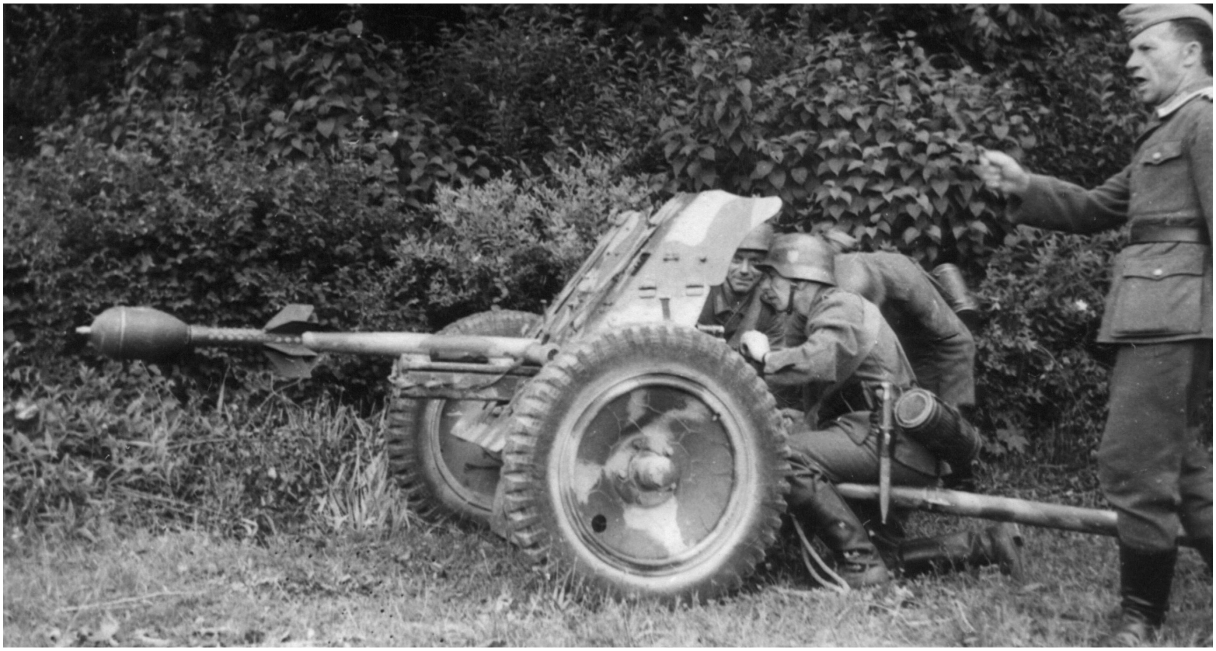
No ammunition available for existing 3.7cm PaK and 5cm PaK anti-tank guns was suitable to be modified using hollow-charge technology. Instead it was decided to develop the Stielgranate 41, a special fin-stabilized hollow-charge stick grenade for the 3.7cm PaK. The projectile was attached to the muzzle of the gun and propelled by a *Hülsenkartusche* (blank cartridge), which accelerated it to 110mps; the slow muzzle velocity resulted in poor accuracy and lack of range, making it a short-range anti-tank weapon. Production of the 3.7cm Stielgranate 41 began in January 1941.

On 22 February 1942, *Kampfgruppe* von Müller produced an information leaflet for the usage of the Stielgranate 41:

> With the 3.7cm Stielgranate 41 it is possible to defeat all enemy tanks at close range, including the most heavily armoured, and it is far superior to all earlier types of anti-tank grenade. Its most effective combat range is less than 130m, but under exceptional circumstances a stationary target can be defeated at up to 250m range. After attaching the Stielgranate to the muzzle of the 3.7cm PaK, the loader has to withdraw behind the gunshield to avoid being injured by the high-pressure gases released on firing.
>
> The ammunition has to be treated as top secret. No gun must fall into enemy hands and all must be provided with demolition charges to destroy the Stielgrananten. Since the supply of ammunition cannot be guaranteed, the Stielgranate must only be used to defeat a 52 or 62-ton tank.

In April 1941, PzJgAbt 134 submitted an after action-report:

> Combat against enemy tanks with the Stielgranate 41 for 3.7cm PaK
>
> Technical information.
>
> Handling the ammunition and gun:
> Since the ammunition is made up of two parts [grenade and cartridge], handling is somewhat cumbersome. The grenade has to be fitted into the muzzle end of the gun barrel; both its size and weight make it difficult to handle. The gun cannot be moved with the grenade attached, as this is certain to cause damage; the fins are particularly vulnerable. However, the extraordinary impact of the grenade outweighs the many disadvantages.



The effectiveness of the 3.7cm PaK was decisively improved by the introduction of the Stielgranate 41. However, the loader had the difficult and dangerous task of crawling to the front of the gun and fitting the hollow-charge projectile into the barrel.

A.) Effect

Each of the Russian T-34 tanks, were destroyed by the first round. The first was hit at some 150m range, the second at 100m. The grenade detonated with a dull thud just after impact followed by an eruption of flame. After the smoke cleared, flames roared from the engine and the turret hatches of both tanks. Both were completely burnt out.

B.) Tactics

Combat using the Stielgranate resemble the tactics of trench warfare. Luckily, each gun was usually threatened by only two to three tanks at a time. After the first tank had been destroyed, the others retreated immediately without firing a shot. Our position on a reverse-slope was ideal, and it is important to keep the Stielgranate well hidden until the target comes within 300m. Beyond this point the tank can easily destroy the gun. A Stielgranate on a gun in our company received a direct hit and exploded, destroying the gun barrel.

C.) Effect on troop morale

On 3 March 1942, two guns with grenades were delivered to us in our positions to the east of Wesniny. By this time, our troops had been involved in constant heavy fighting. The Russians had deployed heavy and super-heavy tanks, which could not be defeated by our weapons: m PaK, le IG, and le Fh with *Rotkopf-Munition* [red-capped ammunition] failed.

> When the first tank was destroyed using a Stielgranate 41, the *Panzerjäger* began to regain trust in their weapons. A short time later a second tank was destroyed..
>
> D.) Fighting against Russian tanks with close-close combat weapons.
> On 21 March 1942, a raiding party, under my command, made up of *Panzerjäger* and pioneers managed to destroy a T-34 tank. Three T-mines placed under the tracks destroyed the running gear, and another T-mine placed under the rear overhang of the turret jammed the rotating ring. Eventually the crew decided to abandon the immobilized tank and were taken prisoner.
>
> Summary
> With introduction of the Stielgranate for 3.7cm PaK, the *Panzerjäger* are once again able to destroy enemy heavy tanks, if only at close range; ideally 100m or closer. However, the most effective close-combat weapons are incendiary bottles [Molotov Cocktails] and the *geballte Ladung* (concentrated charges). Since the Russian tanks emit a lot of fuel vapour, they catch fire easily if we give him a little boost.
> The troop is still lacking a weapon capable of destroying a tank at long range.

The *Panzerjäger* began to receive the *große* Gewehrgranate and the 3.7cm Stielgranate 41 around March/April 1942, and although it had taken eight precious months the force now had close-range weapons capable of destroying all types of Russian tank.

[For completeness: there was a Stielgranate 42 round which had been developed for the 15cm *schwere Infanterie Geschütz* (sIG – heavy infantry assault gun) 33, but this was a mine-type shell for attacking with shrapnel.]

On 3 March 1942, 9.Armee in *Heeresgruppe Mitte* carried out firing trials with currently available weapons near Rshev:

> Weather: sunny
> Temperature: -12 to -15°C
>
> 1.) PaK 38 (5cm)
> Target side of KV-1, angle of impact 90°, 60m range
> Ten rounds PzGrPatr 40 – ten clear hits
> Results:
> Two clear penetrations on the turret (destructive impact)
> Three clear penetrations to the left and centre of the hull also the rear (destructive impact)
> Three hits on the upper hull below the turret (no hindering impact)
> Two hits on the idler wheel and track (no hindering impact)

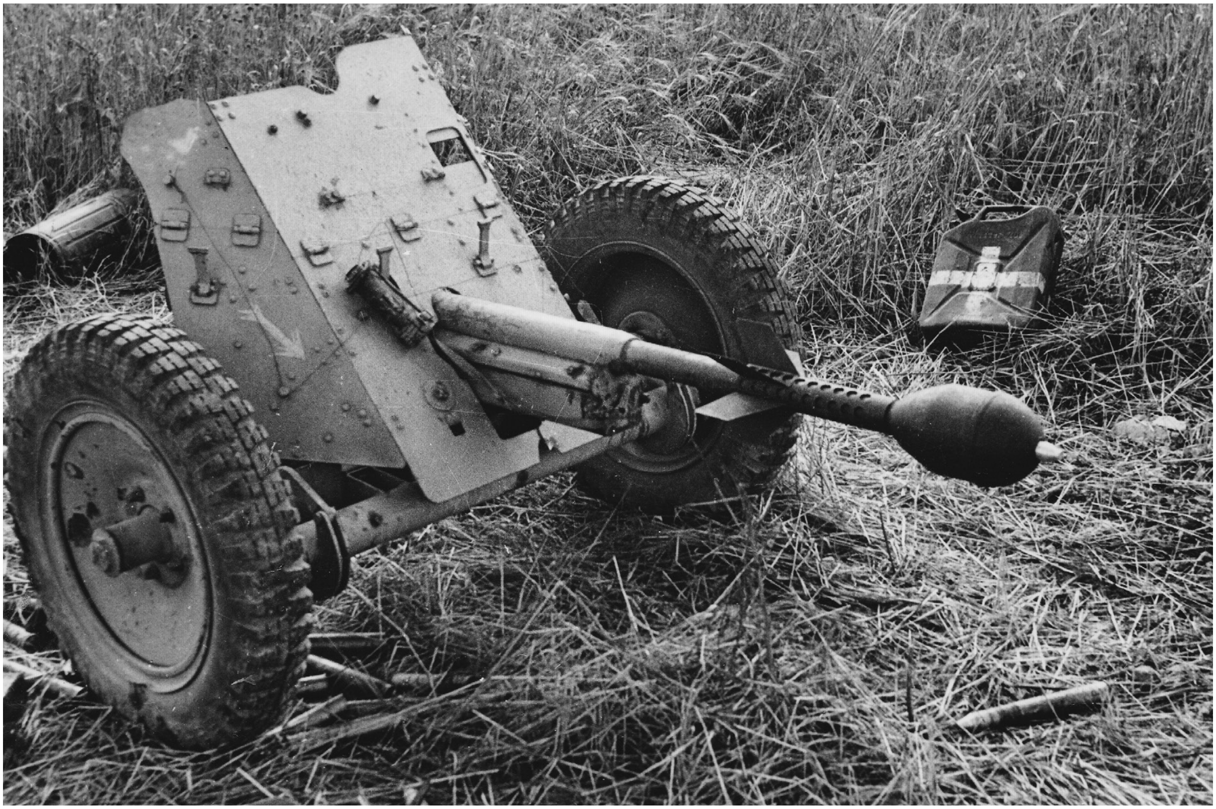
Target side of T-34, angle of impact 75°, 110m range
Eight rounds PzGrPatr 40 – eight clear hits
Results:
Two clear penetrations below the front of the turret (destructive impact)
One clear penetration on the hull (destructive impact)
Two hits on the turret (both ricocheted off)
One hit below turret (ricocheted off)
Two hits on the running wheels (no hindering impact)
Target front of T-34, 20m range
Eight rounds PzGrPatr 40 – eight clear hits
Results:
Two clear penetrations of the turret near the gun barrel (destructive impact)
Three clear hits on the front edge of hull (deep gouges, no hindering impact)
Three clear hits frontal slope, (ricocheted off)

Summary:
Fire from 5cm PaK 38 has destructive impact on the front and side of the turret and on the side of the hull. Hits on the tracks and running gear were ineffective.

Other experiences:
The retraining of gunners proceeded without problems, their accuracy was good. One was an experienced 3.7cm PaK gunner, and he took only a day to be trained on the 5cm PaK.

2.) 2.8cm s PzB 41
Target side of T-34, angle of impact 90°, 60m range
15 rounds – 15 clear hits
Results:
Five clear penetrations on the turret
Three clear penetrations on the hull below the turret (the PaK 38 did not penetrate)
Two clear penetrations on the hull above the running wheels
Three shells lodged in the turret
Three hits on the running gear

Target side of T-34, angle of impact 75°, 110m range
Ten rounds – ten clear hits
Results:
Five clear penetrations on the turret
One shell lodged in the turret



Introduced in early 1942, the Stielgranate 41, although being a short-range weapon, did give the *Panzerjäger* the ability to stop even Soviet heavy tanks.

One shell lodged in the hull
Three hits on the running gear

Summary:
Fire from 2.8cm s PzB 41 has a destructive impact on the side armour, and especially the turret. Due to the fact that the shell spreads fragments, the effect on the crew is certainly to be fatal. There was no impact damage to the tracks and running gear. The shell easily ricocheted off the target.
Other experiences:
The 2.8cm s PzB 41 is the only weapon which can be moved into firing position with absolute certainty under every condition (rocks, mud, and snow). Dismounting the gun is easy, and transporting ammunition is very easy. While the simple traversing mechanism allows rapid fire, gunners require thorough training in the use of the simple spike-type gunsight.

3.) 3.7cm PaK with the new Stielgranate 41
Target side of T-34, 60m range
Three rounds – three clear hits

Results:
One clear penetration on the lower side of the turret, 8cm diameter hole (turret interior totally destroyed)
One clear hit on the idler wheel (destructive impact, immobilized)
One clear hit on the drive sprocket (destructive impact, immobilized)

Target T-34, side, 110m range
Three rounds – Three clear hits
Results:
One clear penetration at turret resulting in a large entry hole and a small exit hole on opposite side (interior totally destroyed)
One clear hit on the idler wheel (destructive impact, immobilized)
One clear hit on the drive sprocket (destructive impact, immobilized)

Summary:
Each clear Stielgranate 41 hit resulted in the destruction of the tank. The effect on troop morale is considerable. The heavy explosion creates a thick black cloud of smoke. Although the tanks did not catch fire, each hit burnt the surface of the armour black and left it covered with an oily petroleum substance.

Other experiences:
The gunners fired the new projectile, which was issued only three days earlier, for the first time. Accuracy was good due to the spike-type gunsight. Thorough training for the gunners is necessary to increase the rate of fire. However, even with the best training the rate of fire is lower when compared to other anti-tank guns. It is appropriate that gunner 1 turns the barrel to the left after firing to allow reloading, then Gunner 2 loads (from in front of the gun) the Stielgranate onto the barrel from a prone position, as at the same time gunner 1 loads the firing cartridge. All this happens as an enemy tank gets closer. The projectile weighs 16kg and is so bulky that only one can be carried safely; perfecting reloading is of utmost importance. The new Stielgranate 41 will allow the 3.7cm PaK, to be used as an effective *Schweige*-PaK (ambush anti-tank gun) against enemy tanks.

4.) *Sturmgeschütz* with 7.5cm KwK
Target side of KV-1, angle of impact approximately 45°, 150m range
Three PzGr, Two SprGr AZ 23, Three HE shells AZ 38 0, all clear hits.
Results:
Turret jammed, otherwise only limited damage
Target side T-34, angle of impact approximately 60°, 70m range

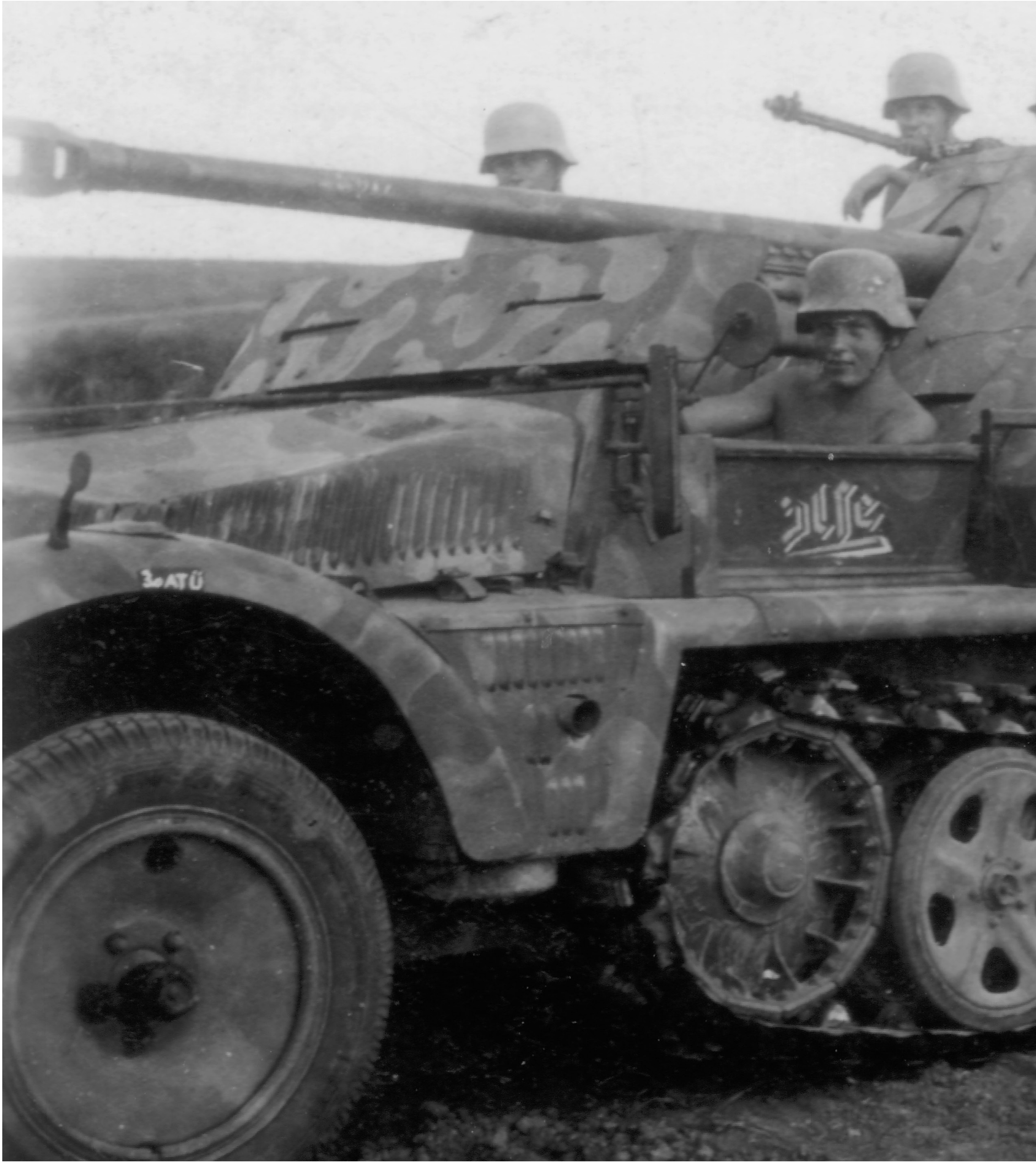
Four SprGr AZ38 – all hits
Results:
Front idler wheel smashed, and the track damaged
Target front T-34, 80m range
Three PzGr, Four SprGr – all hits
Results:
One clear penetration on the turret, driver's and commander's hatches blown off. Two rounds entered the interior through driver's hatch. Tracks have slight damages. Two ricocheted off the sloped front armour.
Target front KV-1, 80m range
Four SprGr AZ 38 – Two clear hits. Two detonated after hitting trees between the gun and tank.
Results:
One hit ripped off the driver's observation port and one hit ricocheted off.

Summary:
Fire from the StuG would have immobilized the tank. Any shell entering through the driver's visor would destroy the tank. It is recommended to fire on the hatches and also the running gear.

5.) 7.5cm le IG 18
Target side KV-1, angle of impact approximately 45°, 250m range
Six Gr 38 Hl hollow-charge rounds; Three hits were detected on the tank (which resulted in some peripheral damage)
Results:
One hit on the turret, no penetration, but the turret jammed
Two hits on the running gear, causing heavy damage (hindering effect)

Other experiences:
The angle of impact was extremely unfavourable. We can safely predict that any straight-on impact will immobilize (possibly destroy) the tank. The running gear is most vulnerable.

6.) 10.5cm le Fh 18
Target side KV-1, angle of impact 45°, 750m range
Five rounds PzKopfGr; Six shaped-charge rounds; Ten rounds PzGr rot [possibly Hl round].
Results:
Since the tank had already been heavily damaged, a clear assessment of the hits was almost impossible. Eight hits could be clearly associated with the le Fh 18; a drive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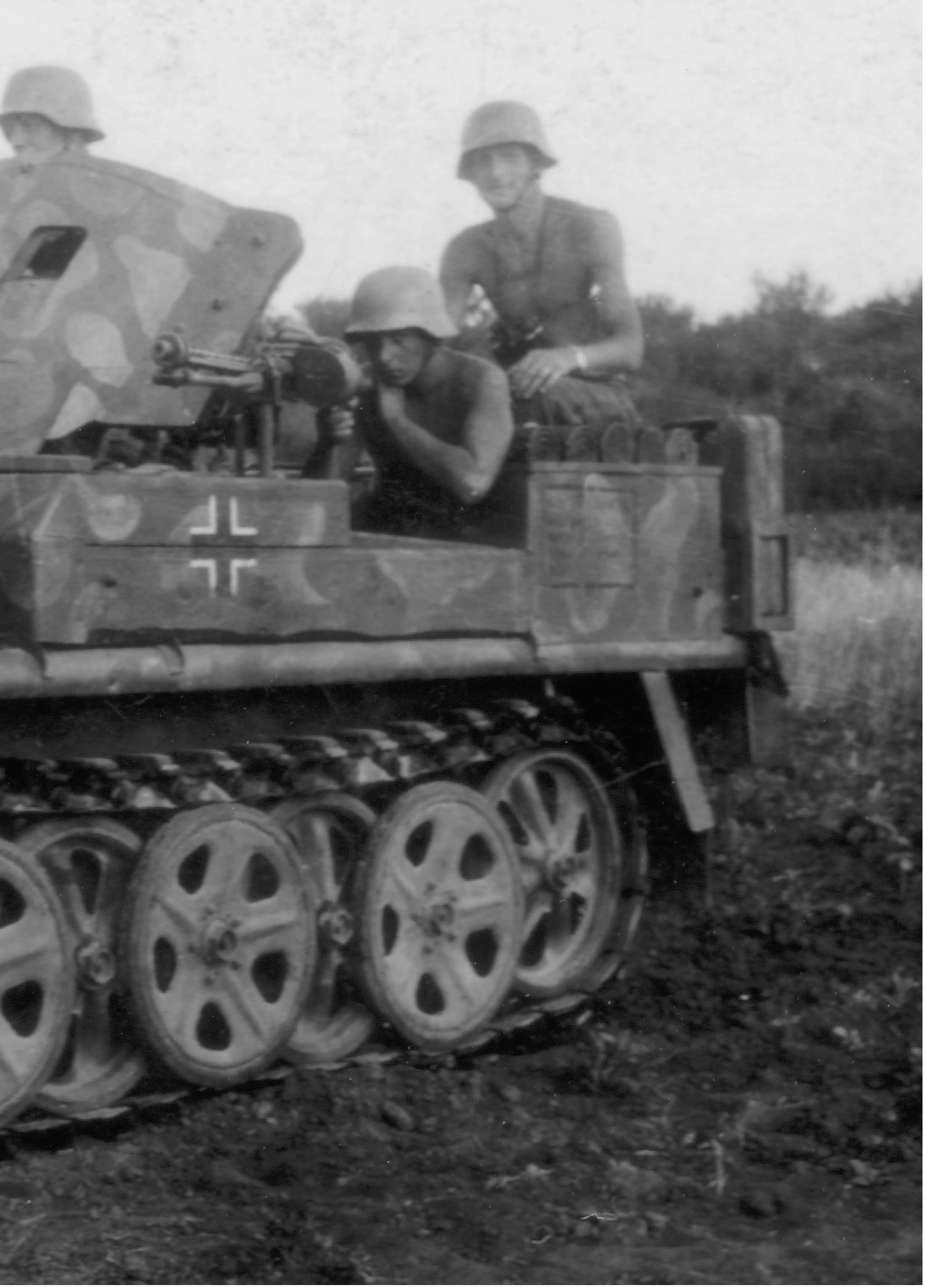


An SdKfz 10 considerably modified by the crew: They have used heavy baulks of timber to mount a 5cm PaK 38 on their vehicle, and fitted a small armoured shield to provide the driver with some protection. An ammunition container has been fitted in the rear of the vehicle, and two *Maschinengewehr* (MG) 15 – and possibly a third – have been mounted for close defence. Sentimentally the vehicle has been named *Ilse*.

An anti-tank unit going about their task of routine servicing: In the foreground, two soldiers use a *Rohrwischer* (bore-cleaning brush) to clean residuals from inside the gun barrel of a s PzB 41.

sprocket was destroyed, and one running wheel was blown off. Also two running wheels were badly damaged, and the engine cover blown off. Five shots were clear ricochets.

Other experiences:
The tank would have been immobilized by the 10.5cm le Fh 18. Close-range fire using PzGr [rot] will result in certain destruction. The gun used was old and had fired more than 4,000 rounds. A gunner requires special training for firing at a tank from over 600m range.

7.) Immobilizing KV-1 with T-mines
Mines placed directly under the track: result – track totally destroyed and the idler wheel smashed
Mine placed half way under a track: result – 80 per cent of the width destroyed
Mine placed under the hull: result – an insignificant dent in the plate

Other experiences:
Mines placed exactly under the track will lead to the tank being immobilized. Although the tank is still able to continue firing, the powerful explosion would

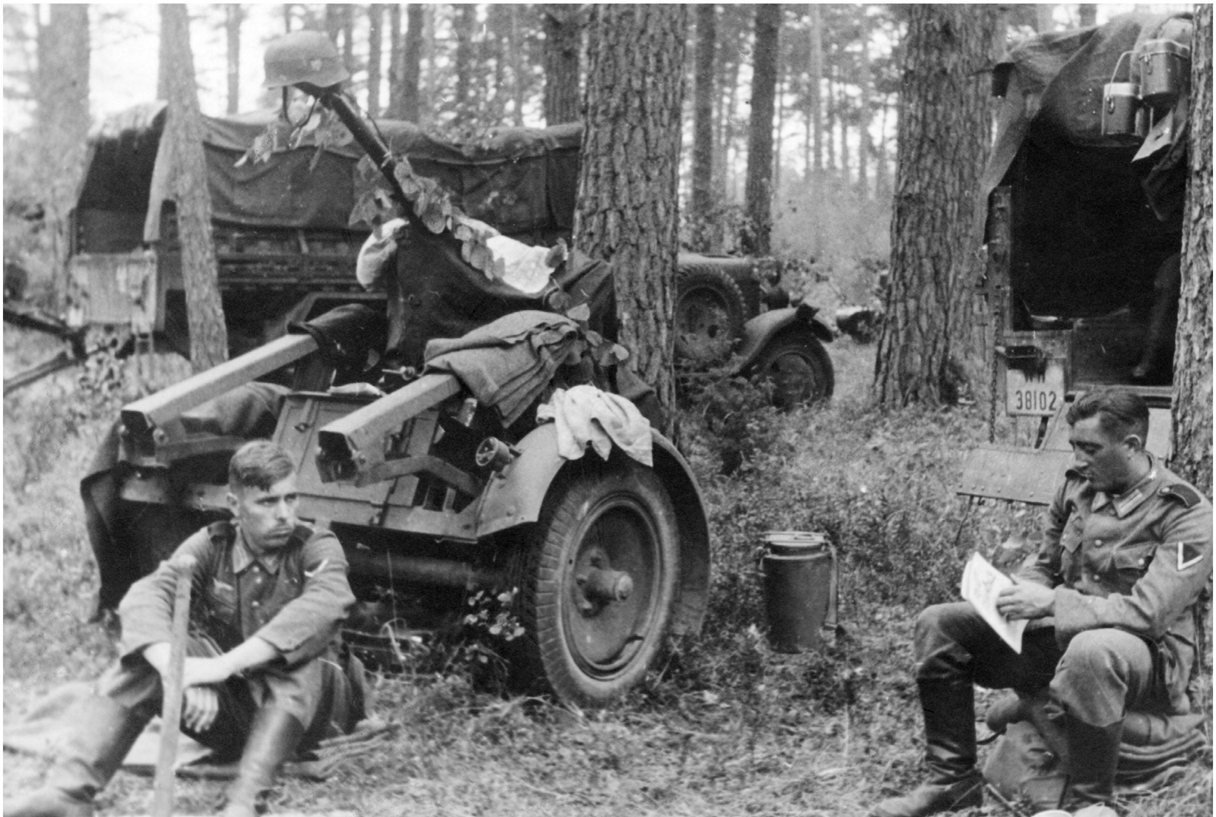
have had a serious effect on the morale of the crew. A further attack by a close-combat team would be required to silence the tank.

Final assessment:
The trial firings clearly showed that all the weapons used are capable of destroying even the heaviest Russian tank as long as they are manned by well-trained men, who will wait in cool anticipation of the enemy reaching the ideal range at which to open fire.
Generaloberst Model

The s PaK Programme

German formations advancing into Russia soon became aware that they lacked suitable weapons to combat heavy tanks at long range. Although an anti-aircraft gun, the 8.8cm FlaK, had proven to be more than adequate, it lacked the mobility required for anti-tank warfare, and it was also very difficult to conceal on the battlefront.

Although the German armaments industry had been developing a number of new types of anti-tank gun since 1940, a date for entry into service was still awaiting confirmation in June 1941.



A 2.8cm s PzB 41 has been loaded onto an SdAnh 32 trailer ready to be moved. Unusually, Einheitsdiesel 6x4 trucks appear to be the towing vehicles.

Conical-shaped Barrels

In June 1941, only one of the three conical-barrelled (taper bore) anti-tank weapons under development became available: the 2.8cm s PzB 41. Tactical deployment of this weapon depended on the supply of tungsten carbide; a critical material for the German war effort which was constantly in short supply.

The lightweight 4.2cm PaK 41 high-performance anti-tank gun had not been cleared for production. On 18 September, the ordnance department announced that four of these guns, designated PaK 2472 (K-Rohr), were to be sent for a troop trials and on completion production was scheduled to start at the end of September 1941. Initially 30 guns were to be supplied each month, but this would be increased in January 1942. The 4.2cm PzGr 41, a tungsten-carbide round produced for the gun, was available but in limited quantities; some 10,000 rounds had been produced by the end of September 1941.

Initially the 4.2cm PaK 41 was only to be issued to the *leichte Infanterie Divisionen* (le InfDiv – light infantry divisions) and also the *Gebirgsdivisionen* (GebDiv – mountain divisions). In February 1942, the OrgAbt ordered that a large proportion of these guns were to be diverted to the *Luftwaffe*.

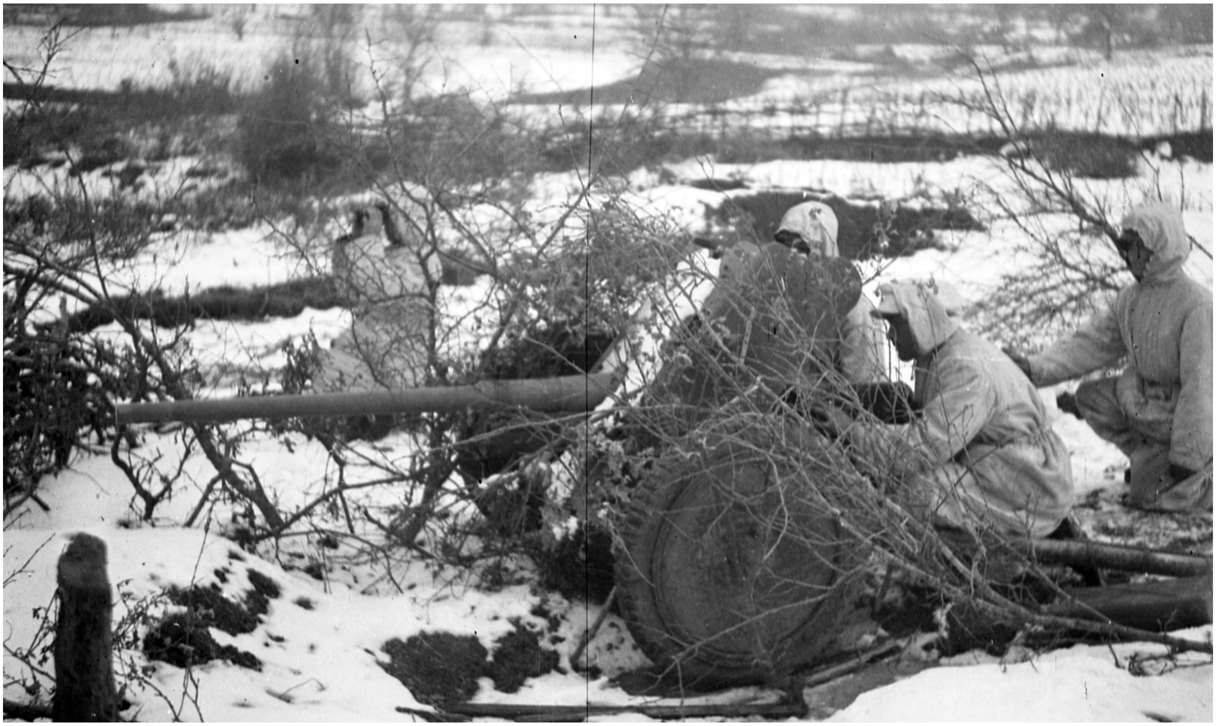
Winter 1941/42: Two *Fallschirmjäger* and their 2.8cm s PzB 41 are positioned behind a pile of snow. While one soldier observes the terrain, the other tries to cook some food.

Three *Gebirgsjäger* demonstrate firing an s PzB 41: The gunner takes aim at the target by using the handles, while the loader is ready to supply ammunition as and when required.

Only 1.GebDiv, 4.GebDiv, 97.le InfDiv and 99.le InfDiv were to be issued completely with the PaK 41; all other units had to continue using the 3.7cm PaK. The production order was initially limited to 150 units. According to official documentation, of the 151 produced 110 were delivered to *Luftwaffe* field units, the remaining 41 being distributed to the above-mentioned units.

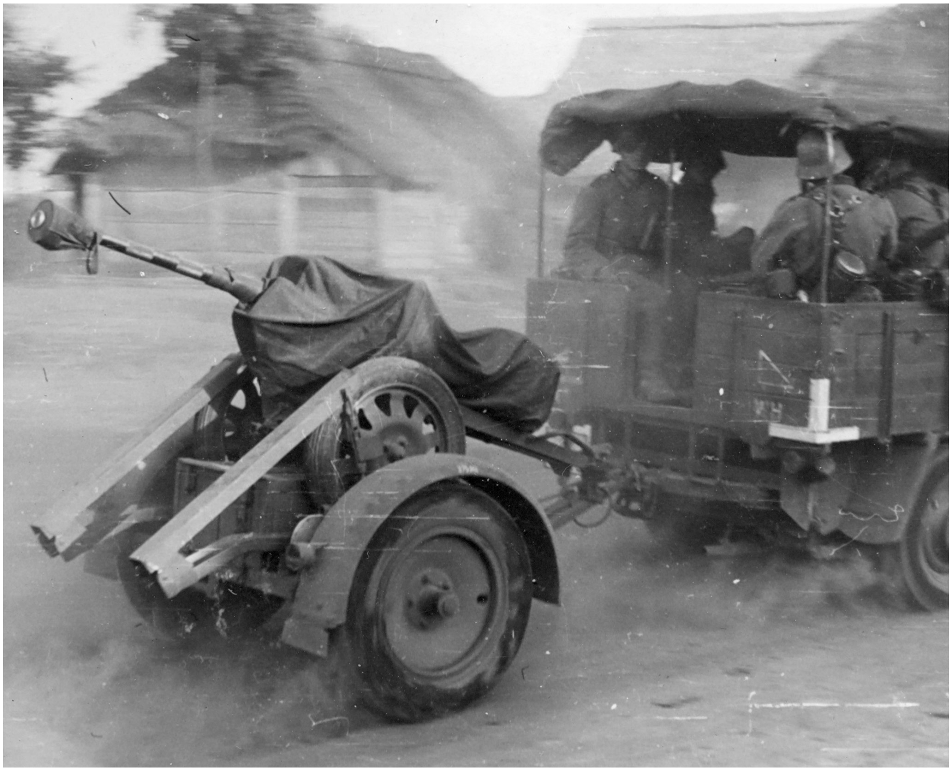
Despite the 4.2cm PaK 41 having a reliable performance, it could only defeat Russian armour at up to 500m range. As 1942 progressed, the weapon was threatened with obsolescence due to the development of new guns. The constant difficulties with the supply of tungsten would accelerate the process.

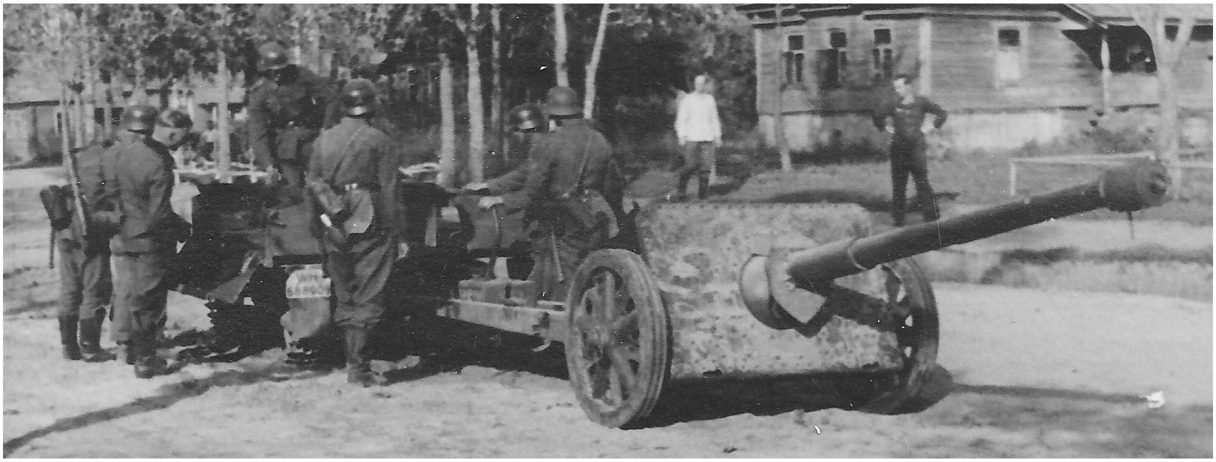
The 7.5cm PaK 41 (developed as the 7.5cm PaK 44) was possibly the most promising of the new designs, but there were still serious problems with the supply of tungsten-carbide ammunition. According to a report dated 22 September from the armaments manufacturer Krupp, four competing designs for the revolutionary sub-calibre bore had been submitted and all were being actively discussed. The report emphasized what performance was expected from this type of gun: that it must be lightweight and have a very low profile; both important for mobility and survivability on the battlefront. It was specified that armour penetration was to be 100mm at 1,000m as a minimum, but as trials progressed 140mm was achieved. Production of this powerful anti-tank gun began and continued until a total of 150 had been built.



Above: The crew of this 4.2cm PaK 41 has been supplied with white winter smocks. The gun has been carefully camouflaged with branches and snow to blend into the sparse terrain.

Right: A 2.8cm s PzB 41 has been loaded on to an SdAnh 32 trailer which has been attached to a light truck. Note the gun and the muzzle brake have been covered to prevent the ingress of dust and grit.





A 7.5cm PaK 41 attached to a British-built Vickers Utility tractor which had been captured from the Belgian army in 1940.

Developments

7.5cm PaK 40

In 1939, Rheinmetall had been contracted to develop a more conventional type of anti-tank gun. The calibre chosen was 7.5cm, a logical increase when the most powerful gun in service was the 5cm PaK. As design and development work continued on the 7.5cm PaK, it became obvious that it could also be used as a KwK tank gun. As a high muzzle velocity was specified, it would be necessary for the gun to be built with a longer-than-normal gun barrel and fitted with a muzzle break. In deference to the new offensive character of the *Panzerjägerwaffe*, the gun was designated *Panzerjägerkanone* 44 (still abbreviated as PaK) and *Kampfwagenkanone* (KwK) 44 tank gun.

In late 1941, the new weapon was ready for production. However at a later date, the 7.5cm PaK 44 was re-designated 7.5cm PaK 40, and the KWK 44 as the KwK40.

The gun fired the following ammunition:

7.5cm SprGrPatr 34	– the standard HE shell
7.5cm PzGrPatr 39	– APCBC round
7.5cm PzGrPatr 40	– HVAP round
7.5cm GrPatr 38 Hl	– HEAT round, shaped charge

Initially production of a small number began in February 1942, and this was steadily increased; 156 in April, 261 in May, 398 in July and 419 in August. After September these figures become unclear as many guns were diverted for the production of PaK 40-armed self-propelled guns built on the chassis of the PzKpfw II and that of the French-built Lorraine *Voiture blindée de chasseurs portés* (armoured mounted-infantry vehicle) 38L.

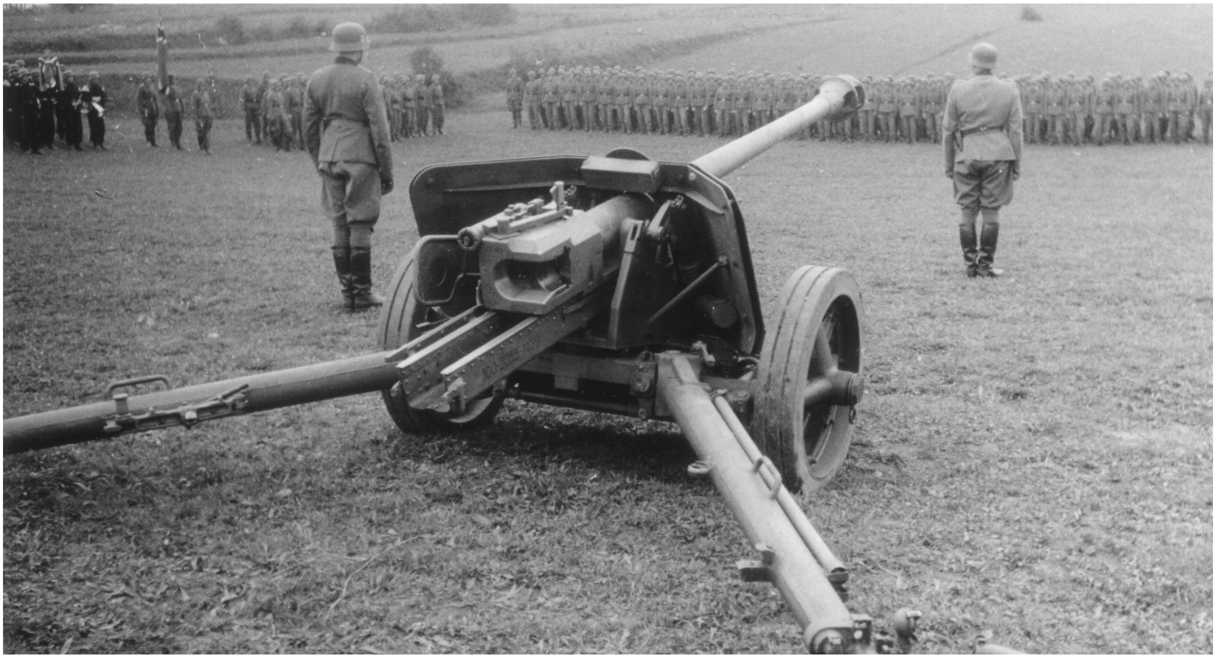
The s PaK

In the autumn of 1941, numerous experts from the armaments industry accompanied by members of various military commissions made many visits to units in combat on the Eastern Front. One, the *Panzerkommission*, was there to examine and make an evaluation of captured enemy tanks and also to assess German armour. Much of what they learnt would be applied to current work including the development of new types, including the PzKpfw VI Tiger and PzKpfw V Panther tanks.

As work continued on the latest tanks, the *schwere Panzerabwehrkanone* (s PaK – heavy anti-tank gun) programme was initiated. However, due to the difficult situation on the Eastern Front, a number of special measures were urgently undertaken: these included expediting the conclusion of current projects; the creation of temporary solutions and the delivery of new guns.

Here is an entry from an OrgAbt diary dated February 1942:

> The s PaK programme was initiated at the end of 1941. Production of s PaK will be accelerated and has priority over all other weapons. As of today we intend to introduce:
> 300 – 4.2cm PaK 41,
> 300 – 7.5cm PaK 40 and PaK 41,
> 400 – 7.62cm PaK 36(r),
> All will be delivered by 31 May 1942.



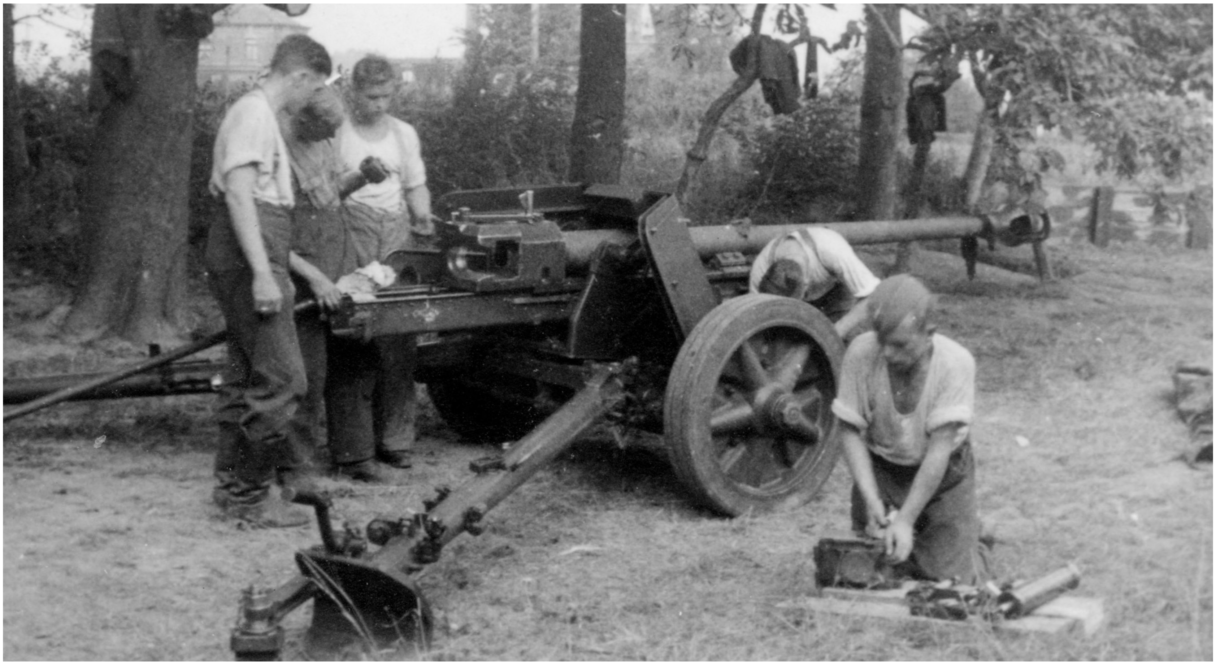
The 7.5cm PaK 44 (soon to be re-designated the PaK 40) was the first gun produced under the s-PaK programme. Deliveries began in early summer 1942, and it was the first of a series of anti-tank guns capable of defeating any Soviet amour at long range.

> Additionally we require:
>
> 1.) Production of the 7.5cm PaK 40 is to be set at 150 per month, but this target figure cannot be achieved until autumn 1942.
> 2.) The FK M 97(f): a one-off production run of 1,000 has been ordered. These guns will receive new carriages.

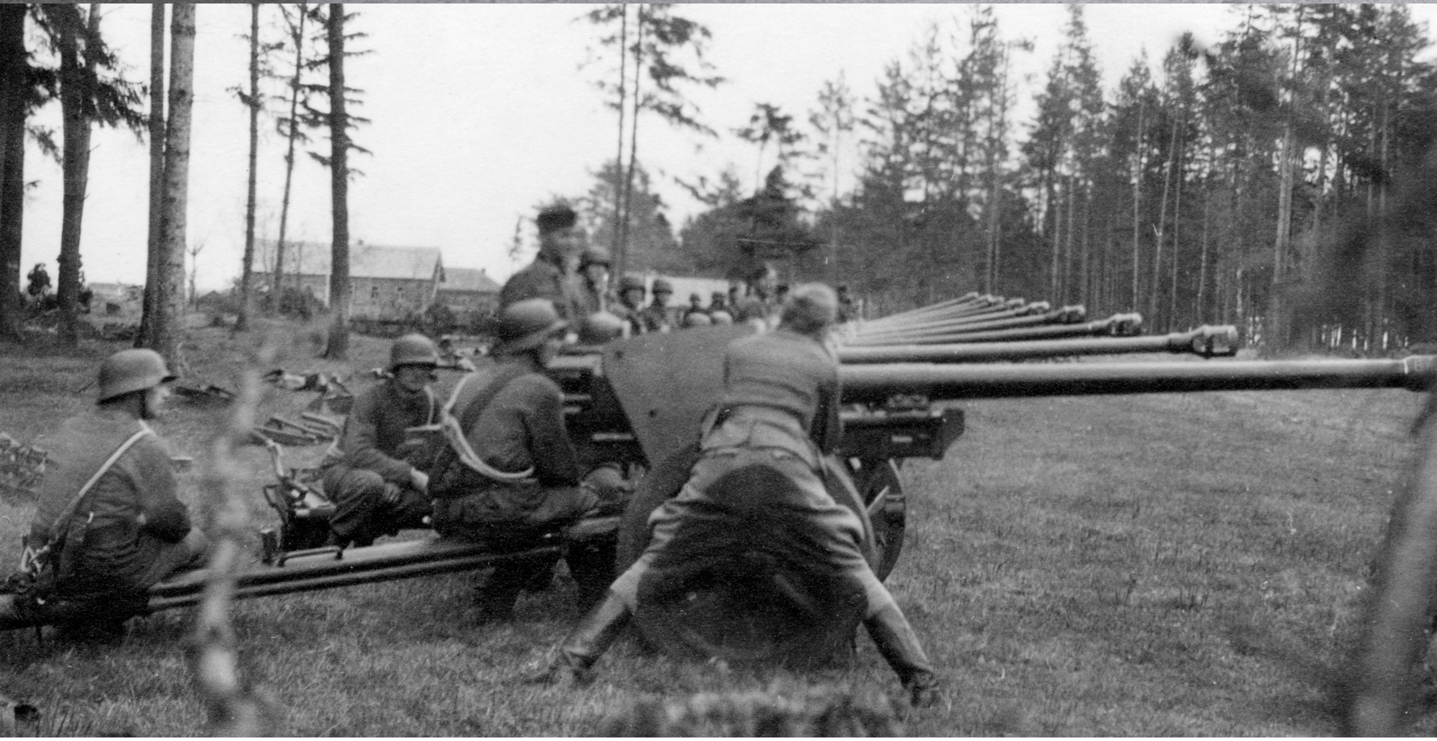
The entry includes the new 4.2cm PaK 41, possibly due to the expected high performance of the gun. The use of commandeered or captured equipment was common practice for the German army; Czech and also French-built anti-tank guns were frequently used. Around this time a number of captured Russian 7.62cm guns entered service as the *Feldkanone* (FK – field gun) 296(r): later it would be modified and designated PaK 36(r). Also work had begun to modify the French-built FK M 97(f).

A month later a *Führerentscheid* (order from the office of the Führer) added more detail to the s PaK programme:

300 – 4.2cm PaK 41
150 – 7.5cm PaK 40
150 – 7.5cm PaK 41
150 – 7.62cm PaK 36(r) mot Zug
120 – 7.62cm PaK 36(r) on Sfl CKD [PzSfl 2]
130 – 7.62cm PaK 36(r) on Sfl PzKpfw II [PzSfl 1]
800 – 7.5cm(f) on PaK 38 chassis



A 7.5cm PaK 40 undergoing routine maintenance: Note the close resemblance to its predecessor, the 5cm PaK 38. However, the PaK 40 weighed some 1,525kg which caused transport problems. As a consequence, part of the production was used to produce self-propelled guns.



A *Panzerjäger* company equipped with nine 7.5cm PaK 40, undergo training on the new gun.

7.5cm PaK 40, Data

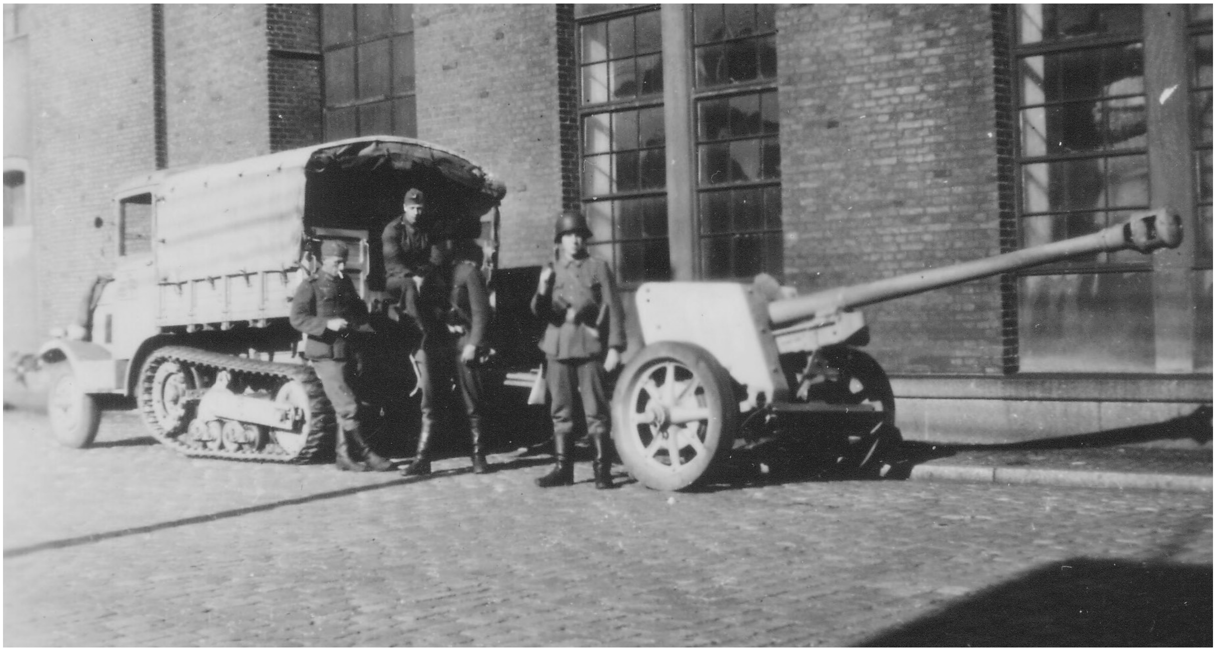
Calibre	7.5cm
Barrel length	3,450mm = L/46
Maximum range	dependent on ammunition
Muzzle velocity	dependent on ammunition
Side traverse	65°
Elevation range	-5° to +22°
Rate of fire	10 to 15rpm
Weight in firing position, standard mount	1,425kg

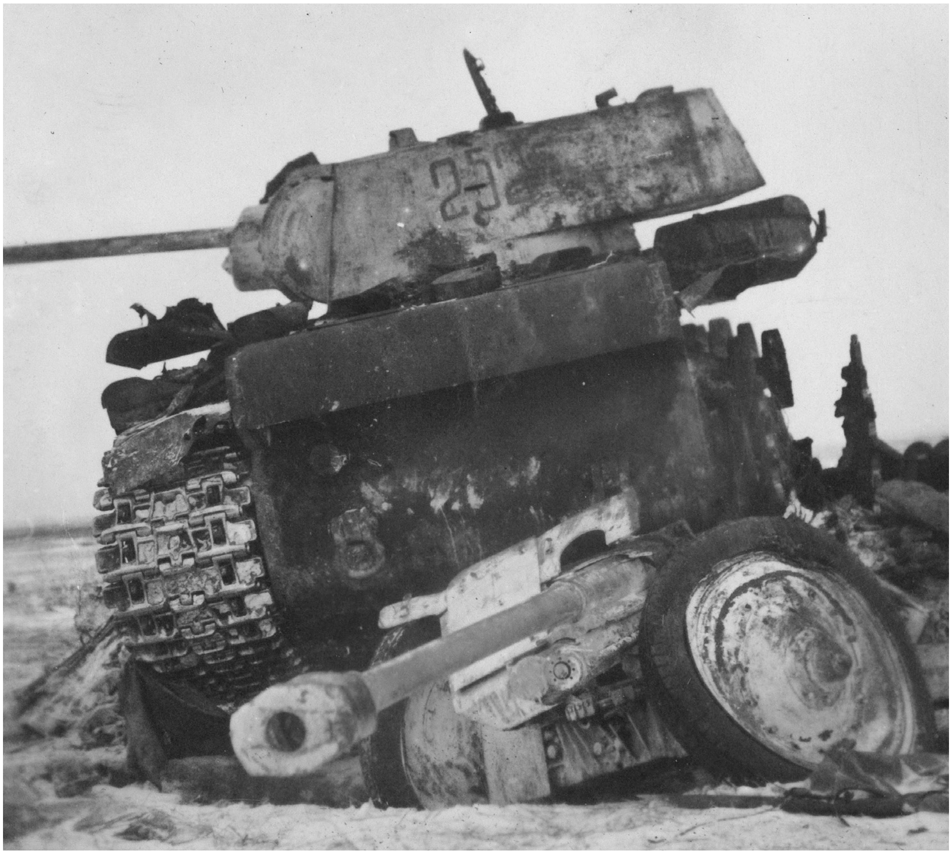
The limited range of elevation did not allow the gun to be used as an artillery piece.

7.5cm PaK 40, Ammunition

Type	**Muzzle velocity**	**Penetration 100m**	**500m**	**1,000m**	**1,500m**	**2,000m**	**maximum range**
PzGrPatr 39	790mps	106mm	96mm	80mm	72mm	63mm	1,800m
PzGrPatr 40	990mps	143mm	120mm	97mm	77mm	–	1,100m
GrPatr 38 Hl/B	450mps	75mm	75mm	75mm	–	–	–
GrPatr 38 Hl/C	450mps	100mm	100mm	100mm	–	–	–
GrPatr 34	550mps	–	–	–	–	–	2,800m

The above performance table confirms the PaK 40 L/48 as a dedicated anti-tank gun.





Above: This 7.5cm PaK 40 is probably painted in the new *Dunkelgelb* (dark yellow) base colour introduced in February 1943. The gun is attached to a Unic P 107 half-track tractor captured from the French army in 1940.

Left: Combat on the Eastern Front was hard. This field gun had originally been captured from the Red Army. In German service the type was designated 7.62cm PaK 36(r). The KV-1 (M 1942) heavy tank has reversed over the gun as it was retreating before receiving a hit which destroyed the running gear.

A 7.5cm PaK 40 has been thoroughly concealed in the remains of a haystack, but after firing a few rounds the gun would be moved to a new position. However, an incendiary round fired by the enemy would easily set fire to the straw.

For the first time the problem of mobility of the s PaK had been identified, before the guns had even entered service. Self-propelled anti-tank guns were now to be produced in parallel with the towed version: production began with the 7.62cm PaK 36(r) and then the 7.5cm PaK 40,

In mid-March 1942, the OrgAbt announced a number of measures to improve the efficiency of the army in the east. A number of units including *Heeresgruppe Nord* (Army Group North) and *Heeresgruppe Mitte* (Centre) were to be pulled out of the battle for rest and refitting. To the commanders of *Heeresgruppe Mitte* in particular, this would decisively weaken the German position: an entry in their war diary notes that there were absolutely no reserves available. In contrast, *Heeresgruppe Süd* (South) were to receive reinforcements in order to have sufficient troops ready for the coming summer offensive. The following entries taken from the war diary of the *Panzerjägertruppe* are interesting:

> Improvement in anti-tank defence
>
> The appearance of new heavy and super-heavy Russian tanks, which we only just managed to combat during the winter fighting, requires the urgent introduction of the most powerful anti-tank guns.
> 1.) le Pak 41
> The taper-bore barrel has a calibre of 27mm at the muzzle. The gun is intended for

> mountain and light divisions. Only 160 will be delivered to the army, due to the lack of suitable [tungsten] ammunition.
> 2.) 7.62cm PaK(r)
> Russian booty: The re-boring of the breech chamber now allows a German anti-tank round to be fired. This gun is now designated as a heavy PaK and two variants are available:
> a.) Self-propelled gun on the chassis of the PzKpfw II (*Flamm*) and the PzKpfw 38(t), intended for *schnelle Verbände* [rapid units] and PzJgAbt of the army
> b.) A mot-Zug *Geschütz* (towed gun) for infantry and motorized infantry divisions
> 3.) 7.5cm PaK 41
> The taper-bore barrel has a calibre of 55mm at the muzzle. The gun is intended for the infantry and motorized infantry divisions. Only 150 are available due to a lack of suitable [tungsten] ammunition.
> 4.) 7.5cm PaK 40 (mot Zug)
> It is intended for this gun to be supplied to infantry, mountain and also light infantry divisions.

There are a number of anomalies: the stated production figures for the 4.2cm PaK 41 are, for an unknown reason, incorrect. Also, again for reasons unknown, the 7.5cm PaK 97/38 has been completely ignored.

7.62cm PaK 36(r)

During the first month of the advance into Russia, German troops captured a large number of 76.2mm field guns which had been abandoned by retreating Soviet forces. The gun was the main equipment for all divisional artillery

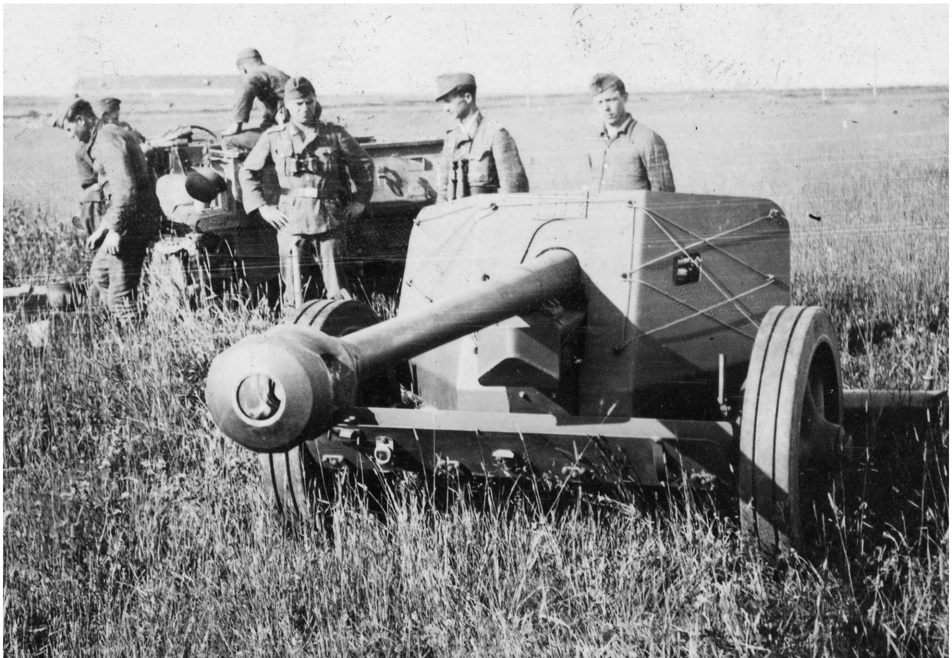
A 7.5cm PaK barely concealed in an open wheat field has fired at a distant target. Note the gun is at full recoil and smoke emits from the breech as the spent cartridge is ejected.

Above: The 7.5cm PaK 40 weighed some 1,524kg, which exceeded the towing capacity of the SdKfz 10 by 50 per cent. Subsequently, after-action reports submitted by *Panzerjäger* units demanded the introduction of a new type of tractor with a towing capacity of at least 3,000kg.

Right: The crew of this 7.5cm PaK 40 has wound wire around the bolts on the gun shield to facilitate the attachment of foliage to camouflage the gun.

units in the Red Army, and although it was a dedicated artillery piece designed for bombarding long-range targets it could be used successfully as an anti-tank gun.

Initially the gun entered German service as the 7.62cm *Feldkanone* 296(r), also the 7.62cm FK 36(r) – the suffix (r) denotes Russian origin. Large amounts of Russian ammunition had also been captured: these included three different types of high-explosive round, one of which had a range of up to 13.7km; another, an anti-tank [APCBC] round, had a muzzle velocity of 687mps. The vast majority



were mounted on a horse-drawn gun carriage fitted with rubber-rimmed spoked metal wheels. Later versions were fitted with pneumatic tyres.

The ballistic performance of the 5cm PaK was easily outclassed by the Fk 296 (r), so military planners decided to bring the gun up to German standards. Firstly the gun shield was reduced in height, which significantly lowered the profile of the gun. This restricted the elevation angle of the gun barrel, but this was considered to be unimportant as the gun was to be used for anti-tank warfare. Also as part of the modifications, the breech chamber was bored out to accommodate German ammunition and a double-baffle muzzle brake was fitted on the gun barrel. On completion of the modifications the gun was designated as the 7.62cm PaK 36(r).

7.62cm Fk 296(r), horse drawn, Data

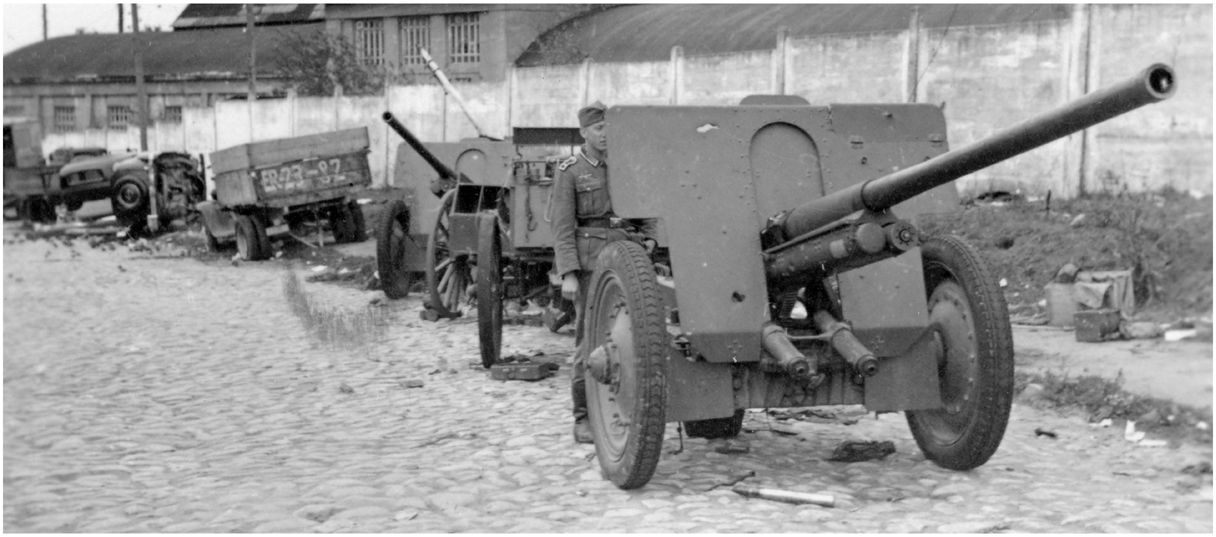
Calibre	7.62cm
Barrel length	3,895mm = L/51.5
Maximum range	dependent on ammunition
Muzzle velocity	dependent on ammunition
Side traverse	65°
Elevation range	-5° to +75°
Rate of fire	18rpm
Weight in firing position, standard mount	1,620kg

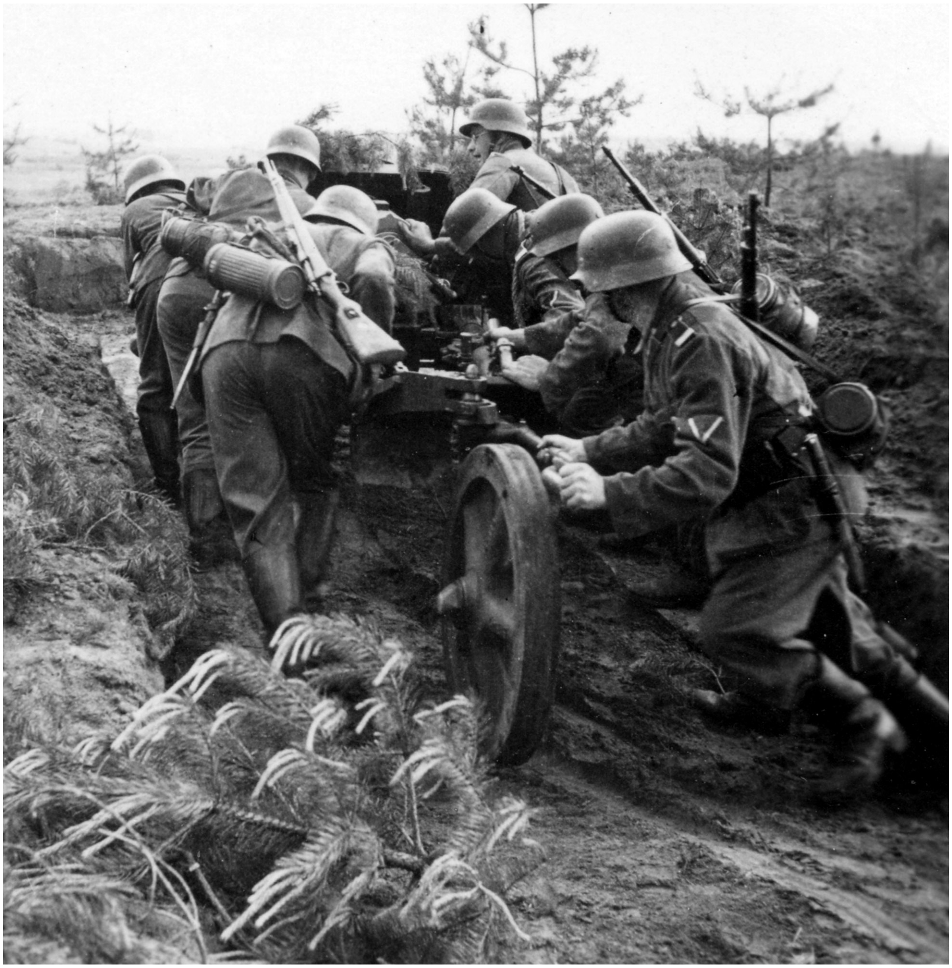
7.62cm PaK 36(r), Data

Calibre	7.62cm
Barrel length	4,176mm = L/55
Maximum range	dependent on ammunition
Muzzle velocity	dependent on ammunition
Side traverse	65°
Elevation range	-6° to +18°
Rate of fire	8 to 12rpm
Weight in firing position, standard mount	1,710kg

7.62cm PaK 36(r) Ammunition

Type	Muzzle velocity	Penetration					maximum range
		100m	500m	1,000m	1,500m	2,000m	
PzGrPatr 39	740mps	98mm	90mm	82mm	73mm	65mm	–
PzGrPatr 40	990mps	135mm	111mm	94mm	75mm	58mm	–
GrPatr 38 Hl/B	450mps	75mm	75mm	75mm	–	–	–
GrPatr 38 Hl/C	450mps	100mm	100mm	100mm	–	–	–
GrPatr 34	550mps	–	–	–	–	–	2,000m





Above: In the opening phase of Operation *Barbarossa* large amounts of Soviet equipment were captured. As German forces did not have an equivalent weapon, the versatile 76.2mm field gun was much sought-after.

Right: A gun crew from 12.InfDiv move their 7.5cm PaK 97/38 into a prepared position at Demyansk near Leningrad. The gun weighed some 1,219kg, which made it almost impossible to move without motor or horse assistance.

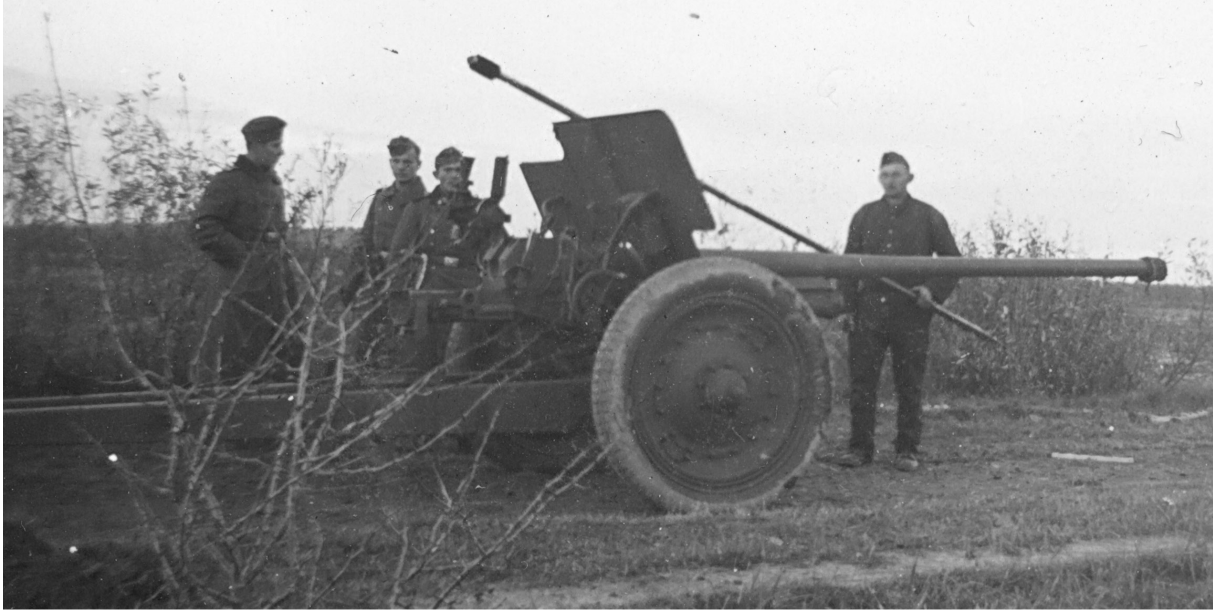
Most of the artillery in the Red Army was, like that of the *Wehrmacht*, horse drawn. Here German troops inspect a 76.2mm field gun, still connected to its limber, abandoned by the Red Army.

7.5cm PaK 97/38

Between 1938 and 1940 large numbers of French-built *Canon de* 75 *mle* 1897, a 75mm field gun, had been commandeered or captured by German forces. This gun, which entered service with the French army in 1898, was one of the first truly modern field guns designed for the artillery. After World War I had ended, France began to export the gun to a number of other nations, including Poland and Czechoslovakia. The German ordnance bureau tested the weapon and found that it had a good ballistic performance and was uncomplicated to build, maintain and operate. The bureau decided to issue the gun to German artillery forces under the designation 7.5cm FK M 97(f).

A document of the *Allgemeines Heeresamt* (general army office) quoted in October 1940:

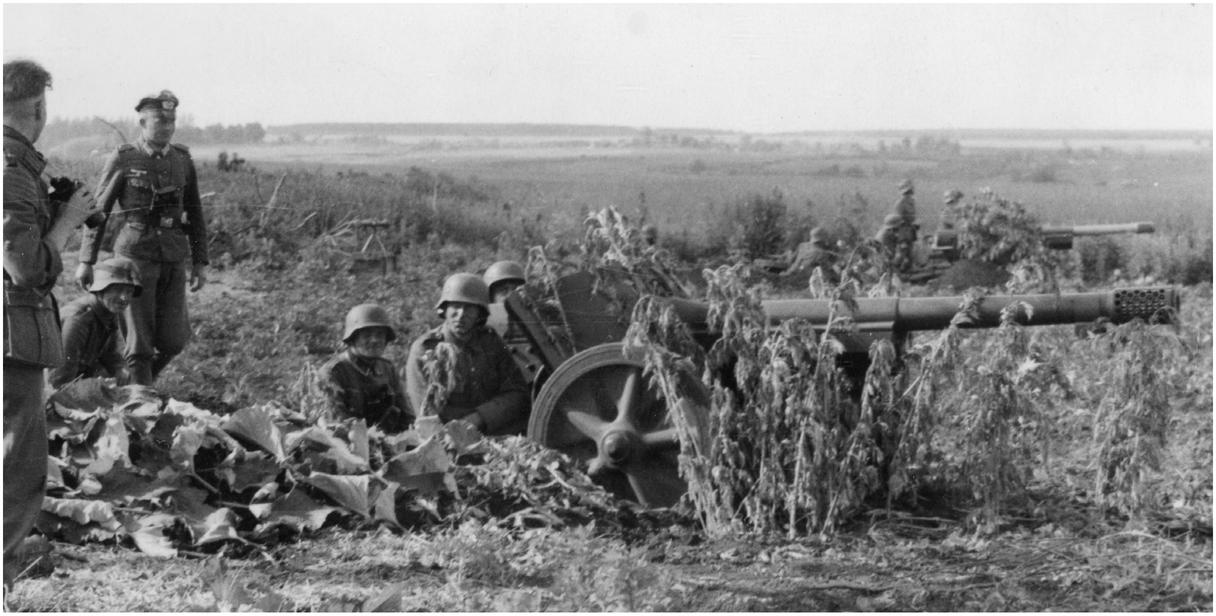
> Memorandum on the *Feldkanone* M 97(f)
>
> 1.) Among the Czech and Polish booty we counted some 860 of these guns. A number were disposed of as follows:
>
> 80 Sold to Bulgaria;
> 410 Delivered to the *Kriegsmarine*;
> 221 Delivered to the *Luftwaffe*;
> 150 To be delivered to the *Luftwaffe*;
> 0 For the army.



A German gun crew prepares to use a *Rohrwischer* (bore-cleaning brush) to clean out the barrel of a 7.62cm *Feldkanone* 296(r). This versatile gun could be used as an artillery or anti-tank weapon with equal success.

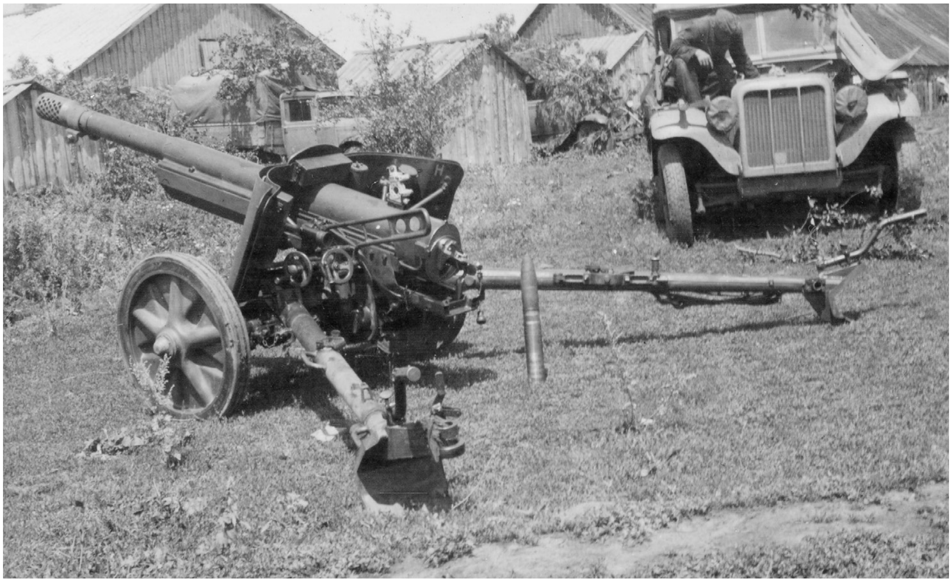
> 2.) Among the booty we have so far collected in the west there are some 2,440 guns of 7.5cm calibre. So far we do not know exactly how many are the FK M 97 type.
>
> 3.) Of those FK M 97 we have counted:
> 44 Delivered to the *Kriegsmarine*;
> 428 Delivered to the *Luftwaffe*;
> 438 Are to be delivered to the army for *Unternehmen* Seelöwe [Operation *Sea Lion*];
> 416 These have have been transported to the Reich. All these guns are to be issued to the *Luftwaffe*.
>
> From the further 1,114 usable guns of all types, a *Luftwaffe* commission will sort out the M 97 guns. According to the *Generalstab der Luftwaffe* (general staff of the air force), all M 97 guns are destined for artillery support batteries.
>
> 4.) 7.5cm Fk M 97 (mot Zug)
> The 7.5cm Fk M 97 was used by the French either as horse-drawn or tractor-drawn artillery. Except for pneumatic tyres, the tractor-drawn gun is absolutely identical to the horse-drawn version. The *Waffenamt* estimates that there are some 60 available.

In early 1942, the *Waffenamt* decided to begin a programme to modify captured guns in an attempt to create more anti-tank weapons capable of defeating all Russian medium and heavy tanks. In March 1942, a number of 7.5cm FK 97(f)

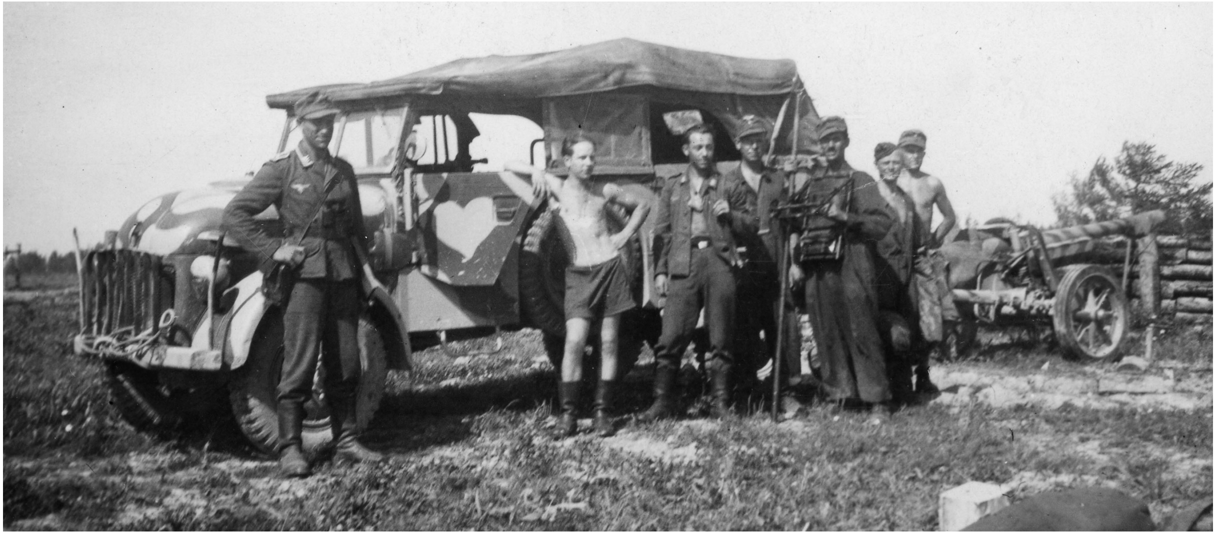


barrels including cradle were delivered to the armaments manufacturer Krupp for conversion to *schwere Panzerabwehrkanone*. The conversion was very straightforward; the gun and cradle was to be mounted on the virtually unchanged carriage from the 5cm PaK 38. The first 500 completed were delivered the *Luftwaffe*. A short time later, the *Chef Oberkommando der Wehrmacht* (Army High Command) responding to an order from the office of the Führer, requested that further barrels to be mounted on the spilt-type carriage of the PaK 40.

Above: The 7.5cm PaK 97/38, introduced in mid-1942, was designed to fire high-explosive and hollow-charge rounds. The gun was created by mounting the complete barrel assembly of a French 75mm M 97 field gun on the carriage of a 5cm PaK 38.



Left: Note the carriage on a 7.5cm PaK 97/38 was virtually unchanged from the original. Also, the rotating-type breech was retained. In the background is an SdKfz 10, the ideal tractor to tow this anti-tank gun.



The Austrian-built Steyr 1500A was used as a towing vehicle for a 7.5cm PaK 97/38. Both the vehicle and gun have been painted in a simple camouflage scheme.

Production started in May 1941, and it was reported that 1,000 were ready for delivery by 1 June 1942. In July a second tranche of 1,000 were ready; of these 96 were issued to Waffen-SS units, and 126 were delivered to Germany's allies. Krupp delivered the last batch of 43 guns in October 1941.

The exact number of FK 97(f) mounted on PaK 40 carriages is unknown, but the gun was officially designated 7.5cm PaK 97/40.

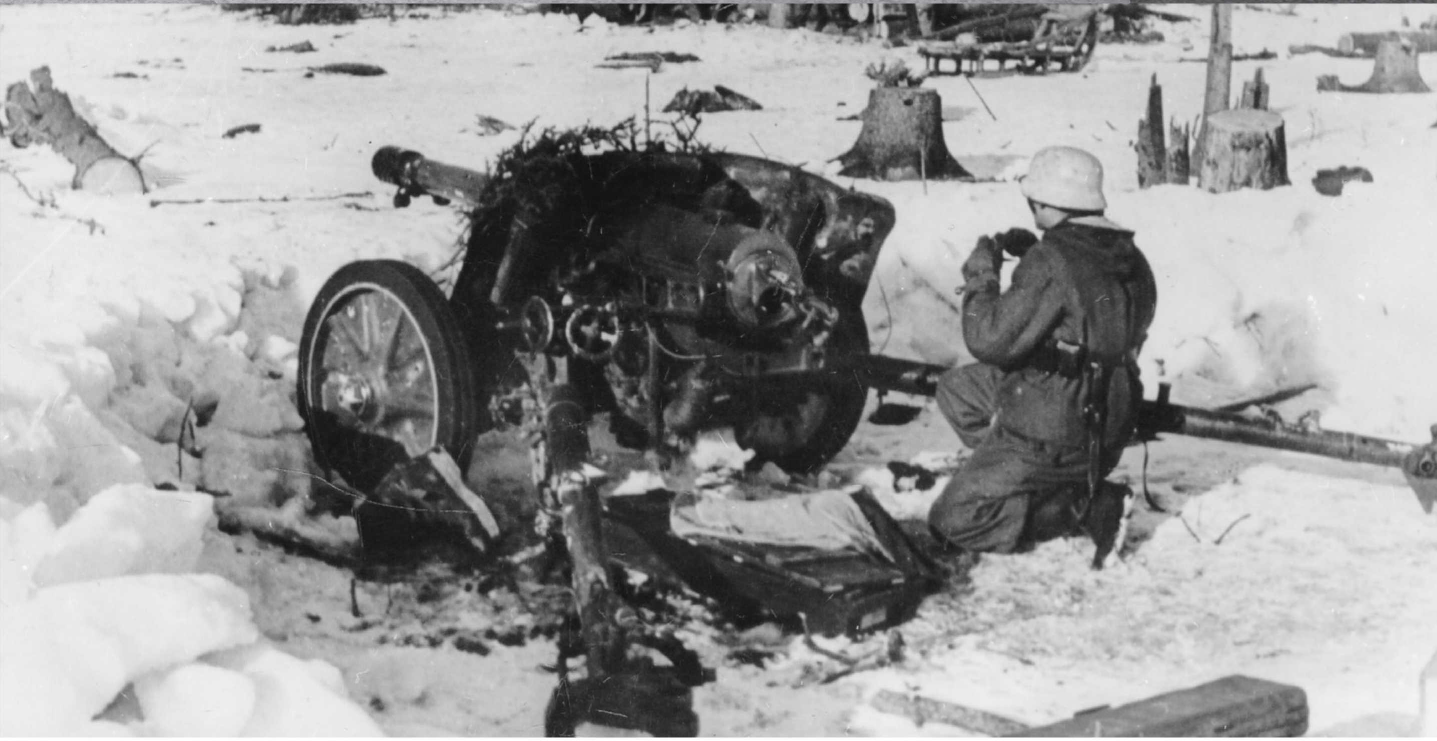
Existing stocks of French high-explosive ammunition were used for infantry support, while the German 7.5cm Granate [*rot*] (Hl) – later designated GrPatr 38 Hl/A, Hl/B or Hl/C – was used to fight tanks.

On 11 December 1941, German forces had to abandon their positions around Moscow and begin a long retreat. The general staff of the army now faced the reality that a major target for Barbarossa had not been taken, and also that the *Ostheer* (army in the east) had been severely reduced in strength.

On the battlefield, the Soviet Union deployed increasing numbers of the highly-mobile T-34 and the almost undefeatable KV heavy tank, while the *Panzerjäger* had to fight both types with outdated equipment; the light 3.7cm PaK and the medium 5cm PaK 38. But this would change in May 1942.

As German forces advanced into the Caucasus, and *Unternehmen* Theseus was launched by Rommel against Tobruk, the war for Germany entered a critical phase.

The production of new, more powerful anti-tank weapons for the *Panzerjäger* (and subsequently the *Panzerwaffe*) was about to begin. In summer 1942, the first of the *Langrohr* (long barrelled) guns entered service, and vast numbers of captured Russian 7.62cm guns and the 7.5cm PaK 40 became available. Surely these weapons would improve the state of the *Panzerjäger* force.



A 7.5cm PaK 97/38 near Leningrad in February 1942: The gun is concealed behind a bank of snow and a clear field-of-fire has been created by the felling of a number of trees.

Was the German army properly prepared to face these challenges; were the *Panzerjäger* now adequately equipped to perform their duty in the face of attacks by massed Soviet tanks; and fight new types of heavily-armoured Allied tanks on the battlefields of North Africa?

The *History of the Panzerjäger* continues in Volume 2.

7.5cm PaK 97/38, Data

Calibre	7.5cm
Barrel length	2,721mm = L/36.6
Maximum range	dependent on ammunition
Muzzle velocity	dependent on ammunition
Side traverse	60°
Elevation range	-8° to +25°
Rate of fire	12 to 14rpm
Weight in firing position, standard mount	1,190kg

7.5cm PaK 97/38, Ammunition

Type	**Muzzle velocity**	**Penetration**				**maximum range**
		100m	**500m**	**1,000m**	**1,500m**	
PzGrPatr 39	n/a	n/a	n/a	53mm	–	–
GrPatr 38 Hl/B	450mps	75mm	75mm	75mm	–	–
GrPatr 34	577mps	–	–	–	–	11,000m

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